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JULY, 1921

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VOL. 5 | CHICAGO, ILL. JULY, 1921 | NO. 10

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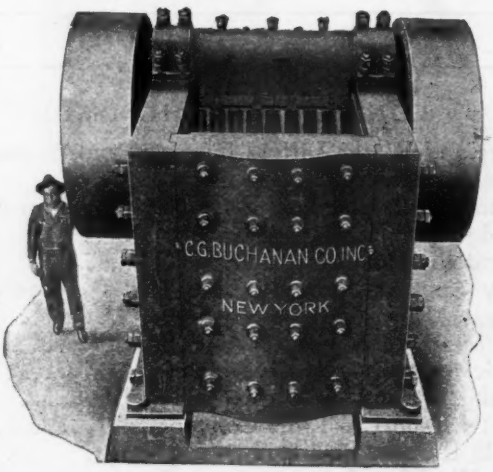

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Plant of Arundel Corporation, Curtis Bay, Md., one of largest Material Handling Plants in United States (other views on page 41)

Elevators and Water Lifters for Sand and Gravel

BY DANIEL J. HAUER.

THIS journal has had several inquiries during the past year regarding handling sand and gravel by hydraulic methods. A number of articles have appeared covering some details of this work, but in every case gravity was available or suggested to assist in the work.

There are, however, cases in which hydraulic methods can be used even when the material must first be elevated from a pit or lower level than the point of discharge. This is done by means of hydraulic elevators and water lifters, instead of using mechanical devices such as bucket elevators, belt conveyors, derricks, cableways, etc.

The use of hydraulic elevators is by no means new, for they have been used in the mining industry for about fifty years with great success.

The device is simple, yet must be designed upon sound engineering principles and the various parts must be according to definite specifications to suit the particular conditions found.

This hydraulic elevator consists of a main chamber called the "elevator ground chamber." This is made of cast iron. Into the side of this chamber is a square mouthed sluice box intake to feed the elevator, or a suction attachment, or both, one coming in on either side of the chamber. There is a metal plate at the bottom of the chamber through which the nozzle from the pressure pipe comes.

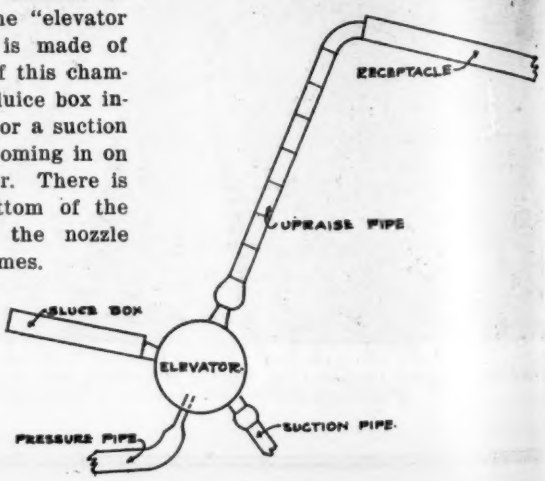
This pipe must have suitable connections with the supply pipe to furnish the necessary pressure to elevate the material.

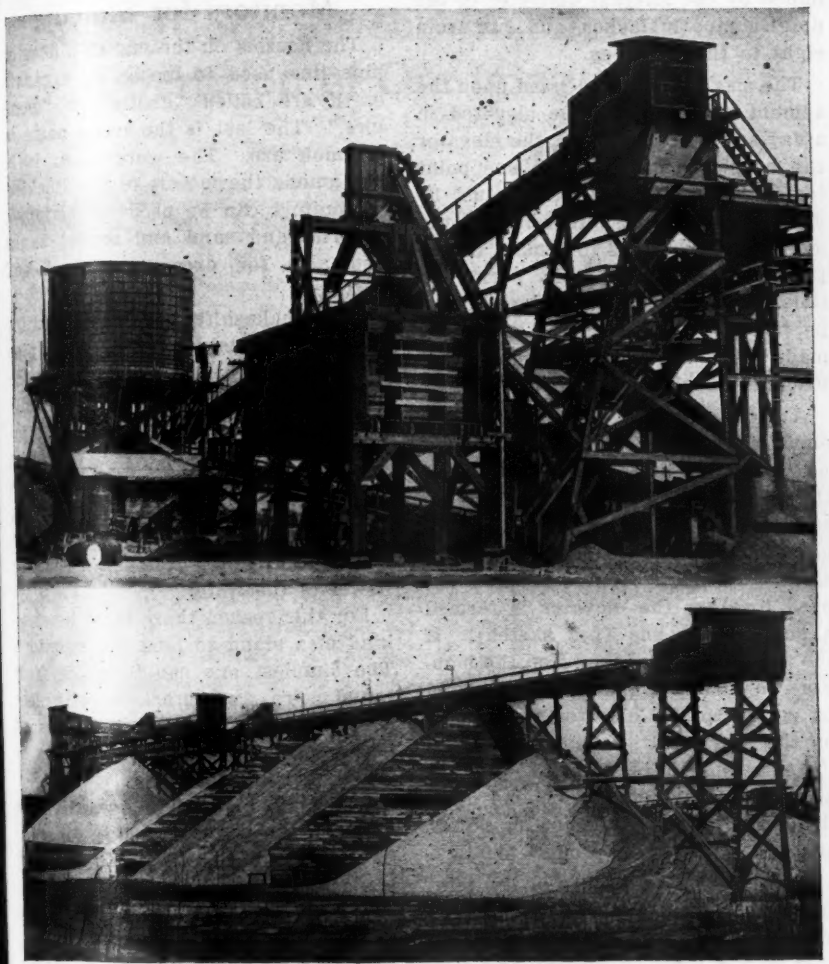
Directly above the elevator ground chamber is the throat section, and above that the elevator outer section which discharges into the upraise pipe, which carries the water and material to the sluice box, bins or washers above.

The principle of the apparatus is that the sand or gravel laden water enters the elevator ground chamber, either through the sluice box mouth or the suction pipe, or both. A jet of water coming through the pressure pipe and the bottom of the chamber is directed upwards through the throat and pipe line.

This jet passing through the contracted area of the throat, together with the water entering the chamber, makes sufficient vacuum to cause a decided suction at the intake of the elevator, so that the sand or gravel mixed with the water is carried up the elevator by impact and friction, delivering it into some receptacle at the top.

This elevator is generally operated by a gravity flow of water having con-





Loading and Conveying Equipment and Storage Yard of Arundel Corporation
(See also page 39)

siderable head, and the modern elevator, if conditions are correct, can raise its load vertically to a height equal to about one-fifth of the head applied to the pressure pipe, varying from one-quarter to one-seventh. Thus gravel has been elevated to a height of about one hundred feet.

Ordinarily, in the sand and gravel business a material flow with sufficient head for such work can seldom be obtained by the use of pumps.

The governing factors are the head and volume of pressure water available, coupled with the volume of water, which comes to the elevator with the sand or gravel. This volume of water is that used to sluice the sand or gravel to the elevator. It must be understood that this elevator will lift water out of a pit in the same way that it elevates either sand or gravel. Nothing larger must be allowed to enter the elevator than will go through the throat.

The sizes on the market are deter-

mined by the internal diameter of the upraise pipe in inches, and run from eight to thirty inches.

The size used must depend upon the amount of material to be elevated in a day and whether or not the elevator can be placed and used at one point for a long period of time or must be moved at frequent intervals. If the hydraulic elevator is to remain in one place for a considerable period of time, then a large, heavy elevator can be installed, but if moves are to be made frequently, then a lighter built machine should be employed.

A trestle can be built to hold the elevator in place and a sump must be excavated to take the bottom of the elevator and give room for the suction pipe. The suction end can be eliminated if desired and only the sluice gate used. Where the two are used together the elevator is termed a combination one (see sketch). If the same pressure is used on the monitors to excavate and sluice the sand or gravel to the elevator as is used on the elevator with pumps throwing the same amount of water, the amount of material handled will depend upon the excavating and transporting power of the water upon the product handled.

This is termed the duty of the miner's inch, which is a measurement of water, not altogether accurate, but one used in the West by miners, and also for irrigation purposes. This and the various features of locating, deciding upon size, pressure needed, etc., should all be put up to a competent engineer or manufacturer of such hydraulic machinery.

One thing is certain, as sand and gravel operators as well as quarrymen learn to know the effective work that can be done by hydraulic machines at a small cost, the more they will employ water to do their work for them.

Missouri is considering the acquisition of a cement plant, to be owned and operated by the state.

Monitors for Sluicing

The nozzles on the end of a hose or pipe line used to loosen or excavate earth are called "giants" or "monitors." The last is the trade name in common use. The word giant is in use among the miners of the Rockies.

Monitors can be used for stripping quarries and sand and gravel banks and also for excavating sand and gravel.

Many makeshifts have been used for monitors, as taking a piece of pipe and tapering it, but the best service can be gotten from those especially manufactured for the purpose. An ordinary nozzle can be used when the pressure is low, but for high pressures men cannot hold them, as the work is too hard and there is danger of men being injured by the high cutting power of the water.

For this reason there must be some kind of a stand to hold the monitors. The simplest one can be made from round wire, two brackets with feet coupled together by welding bars of iron on them, with curved places to lay the monitor.

With this kind of holder, the flow must be stopped continually in order to change the direction of the jet. It is possible to purchase monitors mounted so that by wheels and gears or worms, the direction of the jet can be raised or lowered, or varied from side to side.

Even more elaborate mountings can be gotten of monitors mounted upon tables, that are also operated by means of gears so that the greatest range of work possible can be done.

Monitors are built in different sizes covering their length and the reduction of the size from the inlet end to the outlet end. There is a great range in sizes that can be obtained from the catalogs of manufacturers.

The River Sand and Gravel Co., Owensboro, Ky., has increased its capitalization from $10,000 to $30,000.

Suggestions for the Installation and Operation of Dredging Pumps

BY VICTOR J. MILKOWSKI
Engineer, Morris Machine Works

(The following discussion on the selection and operation of dredging pumps is written as an answer to the various questions asked by pump users and prospective users. It should be of interest to all operators who may find in it some points pertaining to their problems.)

THE function of a dredging pump is to create a rapid flow of water mixed with material through the pump and through the pipe line. The more rapid this flow, the greater the amount of solid material and the larger and heavier the pieces which can be carried with the water in suspension.

The only type of pump which can be used for pumping water containing solid matter is the centrifugal pump, on account of its absence of valves, and a dredging pump is simply a centrifugal pump designed with large passageways and designed also to resist wear.

The prime requisites in a dredging pump are, therefore:

First—It should have sufficient capacity and develop sufficient head to produce a rapid flow in the pipe line.

Second—It should have sufficient clearances to pass through the largest diameter pieces which it is proposed to pump.

Third—It should be designed to withstand the wear and abrasion caused by the mixture of gritty material and water.

Any pump fulfilling these requirements is bound to prove satisfactory, provided it is properly installed and the other conditions are right for its use.

The factors affecting the immediate design and selection of a dredging pump are as follows:

First—The nature of the material to be pumped.

Second—The capacity desired in cubic yards per hour, or the capacity in gallons per minute of discharge.

Third—The total head against which the pump is to operate.

Fourth—The speed at which the pump is to be operated.

Fifth—The amount of power required.

In considering No. 1, that is, the material itself, regard should be given to its nature, the sizes in which it occurs, its hardness and its sharpness. It is assumed in connection with this that the material is loose or means have been provided for loosening it up so that it can be picked up readily by the suction force of the pump. The nature of the material, its hardness, sharpness, and the sizes in which it occurs, have important bearing on the wear which the pump will be subjected to, the wear being the greatest with coarse, hard, sharp gravel. The sizes in which the material occurs determine also the necessary clearances through the pump. It may not always be practical to provide for the maximum sizes, and in that case decision must be made as to what are the largest pieces it is desired to pump.

Considering No. 2, that is, the capacity or output in cubic yards per hour, it should be remembered that this is dependent on the capacity of the pump in gallons per minute of water, on the per cent of solids which can be carried in suspension, and on the proportion of the time that the pump will be in actual operation. The capacity of the pump in gallons per minute is determined by its size and the pumps are usually rated for a velocity of 12 feet per second through the discharge, that is, the capacity of

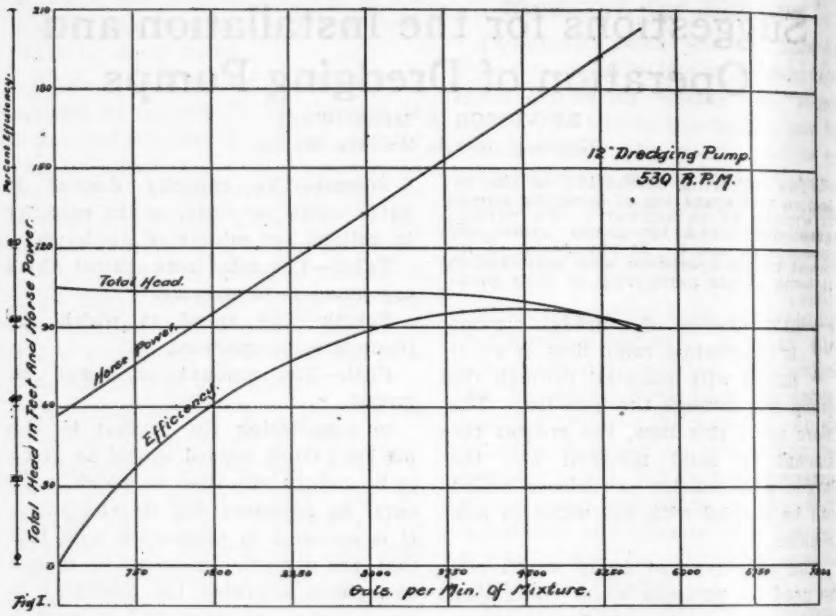


Fig I.

a 12-inch pump is the flow through a 12-inch pipe at the rate of 12 feet per second, or 4,200 gallons per minute. This rating is rather arbitrary and can be varied considerably either way. The per cent of solids which can be carried in suspension is dependent upon the material itself, how uniformly it is fed to the pump, and also upon the velocity of flow in the pipe. When pumping light material such as mud or fine sand, much higher percentage can be carried than when pumping gravel, and under favorable conditions as high as 40 and 50 per cent has been realized. Under average conditions it is usual to figure on about 10 per cent solids. The uniformity of the feed depends upon the arrangement of the rigging for the handling of the suction, and also on the layout of the cuts. To secure best results with the plain suction type of dredge, the rigging must be such that the suction can be readily raised or lowered and moved to either side as desired, and the cut in the bank should be wide and deep, to permit the material to cave in. The percentage is also dependent upon the velocity of flow in the pipe line, being greater for higher velocities. As the friction losses in the pipe line and the amount of power required increase very rapidly with an increase in velocity, it is not economical to employ a greater velocity than 12 or 15 feet per second. For average conditions it is usual to figure on about 12 feet per second. When pumping fine sand or mud, 9 feet per second has proven satisfactory. In pumping heavy gravel a velocity of about 15 feet per second should be used.

Considering the interruptions in operation, it has been found from experience that the pump is shut down from 20 to 40 per cent of the time, from various causes, either at the pump or in other parts of the installation. For average conditions, the actual operating time should be figured at about 75 per cent of the total.

From the above considerations, when figuring on a daily output for average conditions the capacity should

be taken at 10 per cent solids for a velocity of 12 feet per second through the discharge line, and for 75 per cent of the total possible working time. Thus the capacity of a 12-inch pump which at 12 feet per second and 10 per cent solids is 125 cubic yards per hour, can be figured at about 950 cubic yards per 10-hour day.

Considering next No. 3, that is, the total head against which the pump is to operate, this is found to consist of the static head or the actual lift, the friction head, or the friction losses in the pipe line, and of the entry head, or the friction losses at the suction entrance. These should be carefully determined for the maximum conditions under which the pump is expected to operate. The static head is the actual lift in feet measured from the water surface to the end of the discharge line, and is the sum of the suction lift and of the discharge lift. The friction head is the actual loss of head measured in feet necessary to overcome the frictional resistance in the pipe line. It varies as the square of the velocity and as the diameter of the pipe, and becomes very high for small pipes and high velocities. In figuring the friction losses for a mixture of water and solid material it is usual to add from 20 per cent to 30 per cent to the friction losses for clear water. The entry head, or the friction losses at the suction entrance, is the vacuum reduced to feet of head which is created in picking up the material from the bottom and in raising it to the water surface. This varies with the depth, the weight and condition of the material, and the per cent of solids pumped. For average conditions this can be taken at about 12 feet of head.

As the amount of power required, and to a considerable extent the amount of wear in the pump, are determined by the total head against which the pump will operate, it is advisable to make the total head as small as possible.

It is usual to figure on one pump as being suitable for a total head of about 125 feet. Where the required head exceeds this amount, additional pumps can be used as boosters, the pumps being connected in series; that is, the first pump discharges into the suction of the next pump, and so on.

Where the total head is expected to vary, provision must be made to vary the speed of the pump, the head developed varying as the square of the speed. Within small limits the head developed can also be varied by varying the diameter of the impeller, using smaller impellers for lower heads.

Considering next No. 4, that is, the speed of the pump, we find that the total head developed by the pump varies as the square of the peripheral speed of the impeller, and therefore, by varying the diameter of the impeller any speed required can be obtained. In the case of a directly connected pump the speed is frequently determined by the driver, and the diameter of the impeller is then made to suit that speed and the head required. For belt driven pumps, the only limitations to the speed are the wear on the bearings and the wear on the interior of the pump.

The correct speed of a pump for a given head can be found approximately from the formula $R.P.M. = \frac{1680\sqrt{H}}{D}$, where H is the total head in feet and D the diameter of the impeller in inches.

The power required to drive a dredging pump is determined by the capacity of the pump in gallons per minute of water pumped, by the total head against which the pump operates, and also by the weight of material carried in suspension. When pumping clear water the power required may be expressed by the following formula:

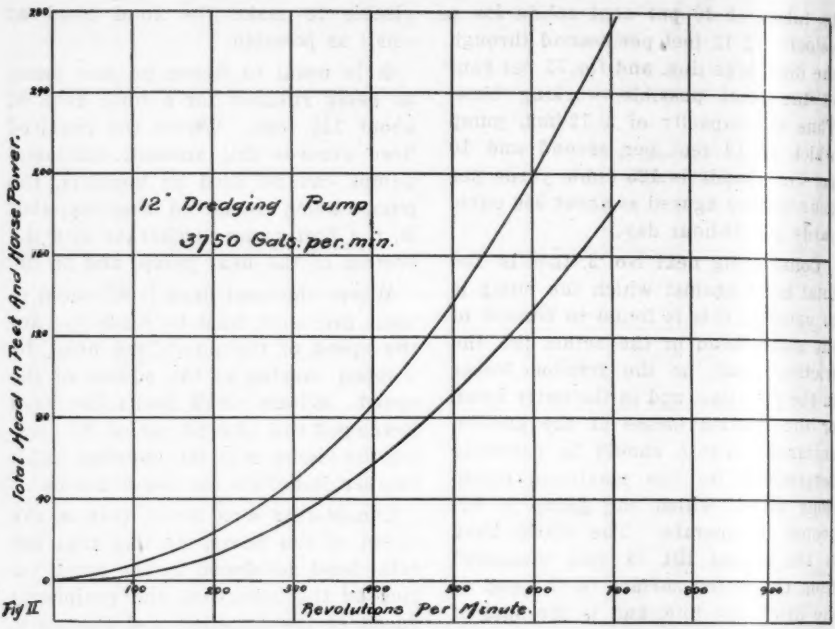


Fig II.

$$HP = \frac{\text{Gals. per min.} \times H}{3960 \times \text{Eff.}}$$, the gallons per minute being the number of gallons discharged by the pump per minute, H being the total head in feet, and efficiency being the efficiency of the pump expressed in decimal fractions. The efficiency varies with the differing sizes of pumps, being about .25 for 2-inch pump, and about .65 for 20-inch pump. For pumping material, about 1 per cent additional power is required for every per cent of material carried in suspension.

Owing to the tendency of a dredging pump to overload the driver if the head is reduced, and because of rapid decrease in efficiency when wear takes place, a liberal surplus of power should be provided.

To illustrate the foregoing discussion, there are given in Fig. 1 the characteristic curves for a 12-inch heavy duty dredging pump illustrated in Fig. 3. This pump is ordinarily rated for a capacity of 4,200 gallons per minute. The efficiency of this pump at that capacity is about .65. At 3,000 gallons per minute the efficiency is about .60, and about the same at 5,600 gallons per minute. This pump can therefore be used efficiently for a velocity of from 9 to 16 feet per second in a 12-inch pipe. The head varies but slightly for the different capacities, but the horsepower increases very rapidly, being 133 HP. at 3,000 gallons per minute and 103 feet head, and 192 HP. at 5,250 gallons per minute and 95 feet head. It is evident from the above that if the length of pipe line or the static head becomes reduced while the speed of the pump remains constant, the capacity as well as the load on the driver will be increased considerably. Fig. 2 shows the relation between the speed of the pump, the horsepower required, and the total head developed in the pump when the capacity is kept constant. Fig. 2 shows clearly the rapid increase in head developed and in the power required when the speed of the pump

is increased although the capacity remains constant.

In connection with the foregoing discussion it may be timely and of some service to give a few hints pertaining particularly to the installation of dredging pumps. These may be summarized as follows:

No. 1—Provide ready means for priming the pump and see that the pump is primed before starting.

No. 2—Make the suction absolutely air tight, otherwise trouble will be experienced in priming and in operating.

No. 3—Make the suction lift, that is, the height from the water surface to the center line of the pump, as small as possible, and make the suction line as short and direct as possible. The total vacuum is limited to 30 feet, or 34 feet of head, and the more used up in lifting water and overcoming friction, the less there is available for picking up the material itself. It is also more difficult to prime and to keep the joints tight when drawing high vacuum.

No. 4—Make the suction line flexible and provide the necessary rigging to handle it readily. The pump will only pick up the material when it is loose and when the suction opening is right close to it.

No. 5—Exclude material from the suction that is too large to go through the pump.

No. 6—Avoid peaks and low spots in the pipe line. Peaks cause air pockets and the low spots will fill up with material if the pump is stopped suddenly. The pipe line should, if possible, be laid with a gradual rise from the water surface to the pump and from the pump to the end of discharge pipe.

No. 7—Provide easy access to the interior of the pump and into the pipe line. Use only long sweep elbows; they cause less friction and are less libale to choke up with material.

No. 8—Provide a supply of clear water to the water seal on the stuffing box. This will keep the grit out of the packing and will save the shaft.

No. 9—Provide suction and pressure gauges on the pump. They cost little and they tell what the pump is doing.

No. 10—Remember that pump parts and pipe line must be renewed at intervals. It is poor economy to operate with the pump badly worn.

No. 11—Do not stop the pump when pumping material. Flush out the pipe line before stopping.

It may also serve some purpose to give here a list of the more common difficulties encountered in the operation of dredging pumps. These may be classified as follows:

No. 1—The pump refusing to prime, or not priming properly. When priming with an ejector, difficulty may be experienced, due to the following:

(a) The flap valve not being seated properly.

(b) Leak in suction pipe, pump casing or stuffing box.

(c) An obstruction in the ejector.

No. 2—The pump not being primed properly. Unless the entire pump casing and the suction pipe are filled with water, trouble will be experienced in starting the pump.

No. 3—Air in the suction line. If the pump discharges a good volume at the start, which gradually diminishes or ceases entirely, the trouble is due to air leaks in the suction line. The vacuum and pressure readings will be low and irregular, or the gauges will not register at all.

No. 4—Obstruction in the suction line. This is indicated by a rattling noise in the pump casing and suction pipe and by a reduction in the volume of the discharge. The vacuum reading is high and the pressure reading is correspondingly low.

No. 5—Obstruction in the discharge line. This is indicated by reduction in the volume of discharge and by a

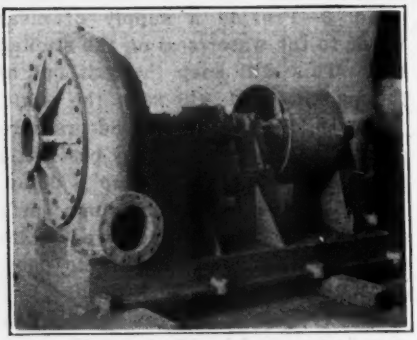


Fig. 3—Morris 12-in. Belt Drive Centrifugal Pump

high pressure reading and a correspondingly low vacuum reading.

No. 6—Material becoming lodged in the impeller. This is indicated by vibration of the pump and by general disturbance in the pressure and vacuum gauge readings.

No. 7—The head being too great for the speed of the pump. This is indicated by reduced volume of discharge and by the pipe line becoming choked up frequently. This can be ascertained by reducing the vacuum and pressure readings to feet of head and comparing this with what the total head should be to secure good results.

No. 8—The head being too low for the speed of the pump. This is indicated by a large volume of discharge and by an overload on the driver. It can be determined by the same method as No. 7.

No. 9—The pump parts being badly worn. This is indicated by reduction in capacity and general inefficiency of the pump.

The foregoing discussion covers the general theory as well as the more common errors and troubles encountered in operation of dredging pumps. However, every dredging installation has its own particular problems which must be solved by the man on the job, and it is to him that this is respectfully submitted.

Labor and the Cost of Production

WE quote the following pertinent sentences from the letter of a cement mill superintendent which recently came to this office:

The problem of reducing the cost of production to keep pace with the decreasing selling price seems to be the outstanding problem at the present time. Any individual business can do this by reducing wages; but before doing this, the effect on the employees must be considered. In many cases they cannot stand any considerable reduction. I feel that the same result can best be accomplished by careful selection of men, reducing common labor to a reasonable figure and paying the skilled labor according to the results they produce. Union labor in particular must come to realize that the simple fact that a man is a member of a union does not justify a demand for the maximum wage. The practice of unions in limiting output must go. Every man, union or non-union, must be allowed to produce as much as he desires. When he does, he will be paid accordingly and the good men (of which the unions claim to have a majority) will be paid top wages.

The employers, on their part, must recognize that some men are worth more than others and be ready to pay more than the scale to men who produce more than the average. Their production will increase in proportion, increased production with the same overhead will mean reduced cost, and the men will be benefited by increased income. This is the plan that open shop men have as a rule adopted.

The Orton & Steinbrenner Co., of Chicago, have just issued an attractive new catalogue. It contains complete data concerning crushers, cranes, and buckets. The "O & S" line is too well known to need any description, but this new catalogue will be very interesting to all power plant operators.

Henry Ford is considering the purchase of three of the Government's nitrate plants at Sheffield, Ala., for use in manufacturing. Mr. Ford recently completed an inspection trip of the plants, accompanied by several railroad officials.

Highway Appropriation Bill Reported Favorably

But Sutton Sees Little Chance of Lower Rates

By Our Washington Correspondent

The railroads of the country have denied to the shippers of road building and other building materials the request that a general reduction in freight rates on these commodities to the level in effect before the general increases of last August be granted without delay. The conference, held here the early part of June, was arranged largely through the efforts of E. Guy Sutton, executive secretary of the National Association of Sand and Gravel Producers, and was attended by shippers of road building materials, representing associations of dealers in cement, crushed stone, sand and gravel, who contended that road building as far as counties and municipalities were concerned, was at a virtual standstill because of high freight rates. A return to former rates, they said, would revive construction.

However, the conferences developed that, while in the opinion of various shippers reductions in freight rates would stimulate the movement of these commodities, the fact remained that this was altogether conjecture, and that there was no assurance that any reduction in freight rates would substantially increase the movement of this traffic. It was admitted that reductions in selling prices of some of the commodities mentioned, far exceeding the present total freight charges, had failed to create a broader market. It was also clearly brought out that the hope of reductions in freight rates has resulted in hesitancy on the part of consumers and dealers to place orders, and because of this it was urged that the carriers promptly announce their conclusion in order that the present uncertainty may be cleared up.

In notifying the shippers of their action, the carriers stated:

"No industry in the country is in more acute distress than are the railroads. Many are not earning their operating expenses and taxes, many more are not earning interest charges, and no group of railroads is earning anything approximating the return contemplated by the transportation act to enable them to provide the facilities necessary to accommodate the normal commerce of the country. Obviously, therefore, the carriers cannot afford to make any general reduction in rates, nor even the reductions that would follow from the acceptance of the shippers' proposals."

After referring to reductions in railroad wages, not yet realized, the executives continued:

"The carriers are vitally interested in any changes which will produce needed revenue and would be justified in considering reductions could they have any reasonable assurance that the volume of traffic would be augmented sufficiently to increase their net return. However, the arguments presented indicate that even in the minds of the shippers the result of any substantial reduction in rates is purely speculative not only as to increased volume of traffic but also to the time when an increased volume of traffic may be expected. It should be universally recognized that the carriers are in no condition to enter the field of uncertain experimentation substantially involving their revenues, for the reason that disappointment in the experiment would result in serious consequences to the public as well as to the carriers themselves, by impairing their ability to continue to furnish needed transportation to the commercial public.

"It must not be overlooked that the

carriers have realized that the percentage increases in rates produced inequalities and in many instances threw rates out of line, and to correct these conditions they have been and are diligently adjusting such conditions. There are doubtless instances and local and special conditions in respect to the movement of commodities necessary for road building and also other traffic which should be considered as emergencies, and the carriers wish to emphasize the fact that arrangements have been made to treat such cases as expeditiously as the circumstances will permit, upon application of shippers to the traffic managers of the interested railroads."

Mr. Sutton believes that it may be expected that a certain amount of relief will be secured by taking up specific cases with the individual railroads as proposed, especially insofar as inequalities and maladjustment of rates are concerned. But he does think that the course of procedure will be slow of operation and will not effect an immediate settlement of the matter, which he considers imperative if construction work is to be stimulated this season.

In connection with the denial of the carriers to grant the request made, Mr. Sutton says:

"It cannot be overlooked that there are many articles analogous to the building materials on which the reduction was requested, on which the demand and the equity of reduced rates could be equally as pressing and as great as they are with respect to the commodities under discussion, and it would be difficult, if not impossible, to prevent the inclusion of these analogous articles in any reduction in rates such as was requested. Thus substantially more than 25 per cent of the total tonnage of the railroads would be either directly or indirectly involved in the requested reductions. The seriousness to the carriers of this proposal is thus evident."

The Senate Postoffice and Postroads Committee has reported favorably the Townsend bill to create a Federal Highway Commisison and to establish an interstate system of public roads. Three Democratic members of the committee—Senators Watson, of Georgia; McKellar, of Tennessee, and Heflin, of Alabama—voted against the bill and will file a minority report, probably recommending that no change be made in the Federal road law. The bill, as ordered reported, provides for a Federal Highway Commission of three members instead of five, as proposed in the original bill. The members of the commission would be appointed by the President with the consent of the Senate and would be paid annual salaries of $10,000.

The annual appropriation of $100,000,000 to aid the states in building roads would be continued for two years, with the specification that the sums alloted to the states must be expended on interstate roads.

The provision granting the commission final authority in the selection of interstate road routes was retained despite strong opposition from Democratic committee members, who asserted it to be usurpation of states' rights. This commission will supersede the Bureau of Roads of the Department of Agriculture, which now supervises the Government aid to the states in the construction of roads, and it will be the duty of this commission to prepare plans for the interstate highway system, which is to afford ingress and egress into and out of all the states and the District of Columbia. The commission is instructed to take into consideration, in framing this plan, the agricultural, commercial, postal and military needs of the nation.

The plan may include highways to and from important water ports, and

highways connecting at the harbor with main highways in countries adjoining the United States. It shall not include the highways in a municipality having a population of 5,000 or more. These municipalities are expected to see that their own highways are in good condition. It is provided, however, that the portion of the highways entering the municipalities along which the houses average more than 200 feet apart may receive Federal aid, but not for a distance of more than a mile. Highways upon which the Federal funds are expended must be sixty-six feet wide, with a twenty foot wearing surface.

What Is a Miner's Inch?

Miner's inch of water is defined by different authorities in slightly different terms and will also vary somewhat in quantity.

Roughly defined, a miner's inch is that quantity of water that will flow from a vertical stand and orifice, 1 inch square, cut through a 1½-inch plank, when the head on the center of the orifice is 6½ inches. This is considered as 9 gallons, equivalent in cubical contents to 1.53 cubic feet flow per minute.

One authority considers it a flow of 2,274 cubic feet of water in 24 hours.

As a gallon of water weighs 8.35 pounds, a miner's inch weighs 75 pounds.

A cubic foot of water weighs 62.5 pounds, being equal to 7.5 gallons.

A flow of a cubic foot of water per second is equal to 450 gallons per minute or 50 miner's inches. Such a flow of water, without regard to pressure or size of orifice, is called by miners a *Sluice Head.*

The M. & S. Sand Co. was recently organized with a capital of $125,000, to deal in sand and gravel, etc., at 419 Market St., Camden, New Jersey.

New Secretary of Michigan Association

Mr. Paul D. Hoel has been elected Secretary-Treasurer of the Michigan Sand and Gravel Association.

Mr. Hoel is assistant sales manager of the Greenville Gravel Co., with main offices at Greenville, Ohio, and plants

Paul D. Hoel, Secretary-Treasurer Michigan Sand & Naval Association.

in Ohio, Michigan and Indiana. He has had long experience in the sand and gravel business, and is exceedingly well equipped to handle his new position.

Other officers elected are: President, Leet E. Denton, of the Federal Sand and Gravel Co., Saginaw, Mich.; vice-president, W. F. Fisher, Tecumseh Sand and Gravel Co., Tecumseh, Mich.; executive secretary, Geo. J. Bolender, of the Chamber of Commerce, Kalamazoo, Michigan.

Mr. Hoel's headquarters will be Hotel Burdick, Kalamazoo, Mich.

Somebody says that advertising space, like silk stockings, gets greatest attention when it is most attractively filled.

Hydraulic Stripping for Overburden

By BRADLEY S. CARR,
Engineer American Manganese Steel Company

IN open-pit mine work wherein it is desired to move the overburden on top of the ore deposit by hydraulic methods, it is first necessary to determine whether the nature of the materials composing the overburden are capable of being sluiced to a sump by means of a hydraulic monitor, or other appliance. From the sump the dredge pump will reclaim the sluiced solids and transport them by pipe line to a spoil bank.

This operation can be accomplished successfully and economically provided, of course, that the quantity of overburden to be handled is large enough to warrant the installation, and also that an ample supply of water is available to remove this overburden with a pump.

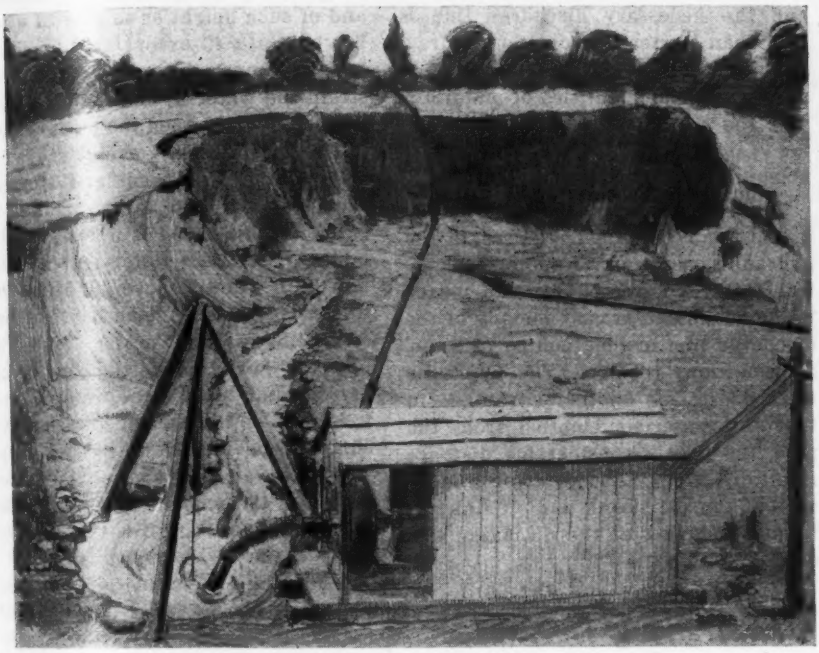
Capacity is added to the pump wherein the installation can be so arranged that the water and solids flow directly from the sump into the suction line of the pump, rather than depending upon the vacuum-creating powers of the pump for elevating materials from the sump to the pump when the pump is situated above the sump water level. This arrangement also eliminates the factor of priming the pump by pressure filling or air removal by vacuum means. If it is possible to make an installation along this line, it will be found to be the most economical operating arrangement from a power consumption standpoint.

The hydraulic stripping is accomplished by employing a monitor. This consists of a reducing nozzle varying from 3 to 5 inches in diameter. Water under pressure from 60 to 250 pounds per square inch is used, depending upon the impact blow to be struck by the stream, which is in direct relation to the length of arc used for the discharge stream from the monitor to the bank to be moved. The size of nozzle opening and pressure used also depend upon the quantity of water to be used in proportion to the size of the pump doing the dredging work at the sump end. All units should be balanced in relation to one another for the quantities of water to be handled.

The jet stream from the monitor in impact breaks down the bank of overburden and conveys the materials to a sump from which the dredge pump removes the water and solids. An auxiliary stream of water is advisable to more uniformly govern the flow of solids to the sump and help maintain a constant supply of water there. There are times when the stream from the monitor pockets itself and dams up from rapid caving in of the overburden bank. Now and then a hindering of a regular flow in the stream to the sump occurs. At best from the digging operations to the sump the path of flow is generally over very rough, irregular surfaces of ground and the sluicing stream is consequently not always dependably regular.

It is well to cover the sump with a grizzly screen or a mesh commensurate with the maximum size of solids which the pump will handle, thus preventing large boulders from entering. These oversize solids would otherwise tend to clog the suction line and impede constant operations.

In general the overburden most commonly encountered consists of a mixture of loam, sand, gravel and sandy clay. The variation of the quantities of solids handled by the pump is occasioned by the class of solids. It is necessary that the larger pieces of clay be broken up before entering the



Typical Sluicing Operation

sump. The pump will handle in proportion a greater yardage when the mixture is below 2 inches in size.

The maximum head against which Amsco heavy duty dredge pumps will operate in single stage installations runs to about 150 feet (total head) or the equivalent of about 65 pounds pressure in the discharge line at the pump position. The total head consists of static head or vertical lift elevation from the sump water level to the point of discharge in the line, plus the friction head in the entire system created by the flow of water and solids through the several passages of suction line, pump, elbows and discharge line.

Should a particular layout, from the physical conditions involved, as to the vertical lift and length of line required, show that the total head exceeds 150 feet, it will be advisable to install a booster unit in series in the line. This booster unit will receive the materials from the discharge line of the primary pump and in turn will continue conveying same to the spoil bank. The booster unit is placed in the line at a point wherein the load on both pumps will be about equal as far as dividing the total head for work to be done is concerned. This arrangement affords the most satisfactory method of operation from a mechanical standpoint.

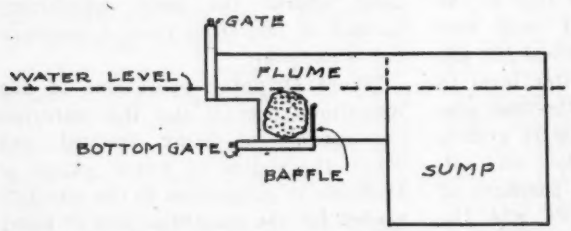
Where stripping operations of any magnitude prevail and the materials are capable of being dredged, and where the source of water supply is available in proportion to the amounts needed for the particular size of pump to be used, there is no longer any doubt that hydraulic stripping and transporting of materials is cheaper in comparison to other practices, as in the use of steam shovels or draglines in conjunction with dump cars and tracks or belt conveyors. The initial costs of the pumping unit complete

and the necessary discharge line is less than a steam shovel or a dragline of proportions equally able to move the same quantities of materials, plus the cost of the requisite conveying system from either type of digging machine to the spoil bank.

There is also a considerable saving in the number of men required in the hydraulic operation. Another economical feature possessed by this means is the advantage of easy moving of the discharge line or lengthening of same, as conditions require. The hydraulic method presents another advantage in that the materials emptied from the pipe line flow a considerable distance in all directions, thus covering a large area at the spoil bank and eliminating frequent moving of the discharge end of the pipe line.

A Straining Device for Pumps

In pumping water with gasoline pumps, there are two conditions existing that make it difficult for the pumps to work. Even with foot valves on the bottom of the suction pipe, the pumps will pick up fine sand, if such occurs in the water, or during the winter time the fine crystals of ice, known as needle ice, will go into the pump and thus into the discharge pipe, causing it to jam and freeze.



These conditions cannot be prevented by building a sump box of timber for the intake pipe, for this box can fill with the sand or ice.

However, if such a box is built in a stream or close by one for a sump, and of such height as to prevent water flowing into it except from a sluice box or flume, then it is possible to strain the water by means of a simple device and thus keep the pumps going.

The accompanying sketch shows the principle of the sump and strainer. Flume is built to the sump with a gate. In this flume is a compartment built so that the water will have to flow into and go over a baffle. In this compartment, clean hay or straw wrapped up in Turkish towels is placed. This catches the sand or ice crystals and strains the water so that it is free of them as it goes into the sump to be picked up by the pump. The gate at the end of the flume regulates the amount of water so that the pump keeps an even flow of water through the strainer compartment.

When the towels and straw become foul, they can be lifted out, the towel washed out and new straw or meadow hay put in. The gate, too, on the bottom of the compartment, can be opened and the flow of water through it will clean it out.

With ice, the compartment must be cleaned oftener, or else the whole mass will freeze.

This is a simple, inexpensive device and can be looked after by the man running the pump.

The Service Sand and Gravel Company of Rockford, Ill., recently incorporated with a capital of $125,000 to deal in gravel, lumber and other building materials. The incorporators are: Swan Lindskold, Joseph Marius, Frances Lindskold.

The Robinson Lime Company of Winchester, Tenn., has organized with a capital stock of $250,000.

The United States cement industry produced 100,000,000 barrels of Portland cement in 1920, consuming 10,000,000 tons of coal.

President's Report to Lime Convention

Emphasizes Vital Necessity for Coöperation

WE meet amidst a period of business depression which in many respects is unparalleled. While our industry is suffering keenly, most of us are certainly passing through these trying times with less injury than is being experienced by the business men of many other industries.

It is such emergencies as the present one which call for strong will power upon the part of the business men to maintain a well-balanced view on the problems of the moment and the assured prospects of better conditions in the future, in order that we may not rashly or radically take steps under the pressure of the moment which might injure us ten-fold in the future.

This applies with equal force both to our own individual business policies and actions as well as in our relations with others in our Asociation efforts.

Of all times, the present certainly calls for still greater unity of action and co-operation among the lime manufacturers of the United States. To push forward unitedly and without interruption on definite plans for the upbuilding of the industry is the one policy that will lead to the big goal of larger sales during the next few years.

That it is possible to double and treble the consumption of lime products in the next five to ten years is not doubted by those who know the undeveloped fields.

If any one knows a better program than that which is being so courageously supported by over one hundred and twenty lime manufacturers of our country, and so well administered by the twenty members of your National Board of Directors, then that person has not yet come forward with the better suggestion.

I can state without fear of contradiction that the present plans in the main are leading us into safe ground for permanent development and extension of the use of lime products and on lines commanding respect and confidence of tens of thousands of lime consumers.

I have closely watched the development, the results, and the growing, broadening interest of present and prospective lime users throughout the country, and I feel confident that the work is well launched. The past twelve months has seen a steady effort to strengthen the personnel and the detailed working plans of each major department of your association. The work is proceeding hour after hour in the Washington office and radiating throughout the country.

The work of starting and perfecting district bureaus to carry our messages in all directions and to make the local contacts more intelligently, has also proceeded in a most gratifying manner. Certain sections are not yet covered with this important and intensive field work, but if the same progress with this plan of district development and local group co-operation, can be made in the next twelve months as recorded in the past fiscal year, then we can consider this division of our association program well advanced.

Upwards of a million pieces of well studied, thoroughly planned and ably executed literature reaching to all points of the United States, with constant and increasing calls for more and more information from present and prospective users, is but one effect of increasing value arising from your association work.

Step by step millions are learning more and more about lime in the agricultural, chemical and construction fields, and this is gradually and steadily producing a large number of users.

I will not attempt to detail the work of the organization, as it has become too extended to occupy much space in a President's annual report. The reports of your manager and department heads presented throughout the three-day session of this Annual Convention will speak for themselves

By way of illustration, however, I wish briefly to refer to one or two problems, that you may realize the large amount of underlying work conducted by your Association, much of which cannot develop immediately, but will provide practical results as the months and years go by.

Take, for instance, the problem of developing the best type of quick hardening lime plaster and mortar. This question is of great importance to the construction field. It has been attempted more or less superficially and spasmodically by many manufacturers as well as in some of the past efforts of your association staff.

Under past efforts the problem has not been suitably solved for the broad welfare of the industry. It has not been until within the fiscal year just closing that we have been able to lay a broad plan for its study, utilizing fellowships at the Bureau of Standards and elsewhere for taking hold of particular phases of the problem with the intention of gradually bringing all these lines together into a broad basic report that will throw the fullest light on the proposition.

To get at this problem there are four major lines of study and research that have to be undertaken, and each of these four major divisions fans out into numerous sub-studies and minor researches to uncover any facts bearing on the main proposition.

The four major studies cover:—

First—The effect of burning, grinding and hydration in various combinations and in conjunction with other ingredients to locate any refinement in manufacturing processes that may stimulate hardening in the finished product.

Second—The study of any hardening materials which of and by themselves and upon addition to lime will harden the mixed product. This covers the field of Portland Cement, gypsum, Keene's cement and numerous other quick hardening products as additions to lime. Possibilities in this direction are but very slightly known and careful research work through a long series of tests is essential.

Third—Since carbon dioxide is the ingredient first naturally employed in the normal hardening of plasters and mortars, but limited by the slow effect and small quantity of this gas found in normal atmosphere, it becomes necessary to determine all materials, such as charcoal, which might absorb carbonic gas in quantity yet hold it so loosely that upon admixture with lime and water a quick release of the carbonic gas would produce rapid carbonization and hardening throughout the mass. There are many materials which can hold carbonic gas in this fashion, but their various effects and manner of action in combination with lime products must be thoroughly investigated through laboratory studies and practical application.

Fourth—In chemistry we not infrequently find materials which in small quantities added to some other product will cause that other product to take on entirely new chemical and physical characteristics. It is within the bounds of possibility that we can locate among the numerous chemical compounds, such a material which upon addition in small quantities to lime will immediately establish in the lime an entirely new hardening characteristic and solve our problem in that fashion. This would make of lime a self hardener like cement and gypsum, which cementing materials do

not need the use of any help from the atmosphere for hardening throughout the mass.

By glancing at these broad lines of study and realizing how many separate investigations must be made under each of the general headings, you can comprehend one of the problems that your National Lime Association has set for itself in your behalf. Only a National Association clearing its work through a high class central staff can economically and effectively handle such problems.

Must we go through with this research to the last possible combination and then piece our data together, possibly combining one feature of Group No. 2 with a feature of Group No. 4 to give us the final answer? Undoubtedly. But we must realize that such investigations cost tens of thousands of dollars and a great deal of patience.

When the answer is reached it means literally millions of dollars to the industry and probably the saving of its life.

We must see these things in their broad aspect and continue with patience to work on such problems if we are to accomplish our National aim.

Again, to illustrate by a type of question that frequently arises which only a National Associattion can properly handle, I wish to direct your attention to one more plea that has recently arisen.

Herbert Hoover, Secretary of Commerce, has seen that one of the numerous things to be done in this country is to standarize, picking the best methods of economic construction out of practices in the construction field and by developing a sound economic building code, the workmen's homes of the future and construction for all, will be improved and cheapened.

He calls into being an Advisory Committee. Professor Ira H. Woolson, one of the most experienced and widely known construction research engineers in the country is selected as Chairman. He seeks co-operation with each industry to get its best thought and help. Our National Lime Association is ready; immediately offers its services, and has part of the valuable data already at hand.

Lime practices properly presented and brought carefully to the attention of this Committee should serve both the country's need and increase our industry's tonnage by the decisions that this Hoover Committee will doubtless reach.

Lime has been displaced for the sake of a little speed, but at greater other expense in many lines of construction. The Hoover Committee headed by Profesor Woolson should help to return the country to more sane and more economic practices. But our industry must be co-ordinated and working through a central staff to be able to effectively bring our data and arguments before the Hoover Committee.

We are prepared to do it. Five years ago it would have been an impossibility for the lime industry to have effectively carried through this co-operation. It must be self-evident that none but a central body radiating its touch and collecting its information from all parts of the United States could effectively cope with the program of the Hoover Committee. So I congratulate the industry again in the work it is doing and in the preparation it is showing to meet these constantly arising problems.

Today every live industry has its live association, and the industry that has not confidence in its future, and has not the "punch" to put its program across, shows its weakness and may ring its death knell by inadequate co-operation and inactive association work.

We should all be consciously proud of our Association growth during the past three or four years. It is a big job and is slow in getting under way. Here and there it will be poorly done and steps must be retraced to make a fresh start, but the constant forward progress is evident to those who but compare the situation in the lime industry today with that of five years ago.

I welcome you and congratulate you upon your faith and support, and upon the progress that is being made in the research and educational work in behalf of lime products. The commercial results cannot fail to follow the flag.

Respectfully submitted,

CHARLES WARNER, President.

Lime Kiln Built in 1776 Still Standing

Believed to Be First Kiln Built in America

There is a tradition in the Dexter family, of Rhode Island, that they were the discoverers of lime stone in America. They claim that while clearing a tract of land obtained in a land grant, a fire was built under a large boulder. After the fire went out, they found that the rock had crumbled. On examination, it was found to be lime.

Whatever the truth of the tradition, it is true that an ancient kiln stands on the Old Lantern Road, near North Providence, Rhode Island, and old settlers say that it was used for burning lime during the Revolutionary War.

The State of Illinois has awarded contracts for 26.38 miles of concrete highway, at a contract price of $532,307.15.

Acquisition of a state cement plant as part of the program to be carried out under the $60,000,000.00 road plan was recommended to the special session of the Missouri legislature, which convened at Jefferson City June 15.

Delivers His Material in Motor Trucks

So He Is Another Man Who Doesn't Worry About Freight Rates

Last month we wrote about Mr. Henry J. Muno, who built an unusual plant from his own design, and who sold his product direct to the contractors.

Mr. J. C. Schockweiler, of Chicago, has built a new plant very similar to Mr. Muno's, with a few modifications of his own.

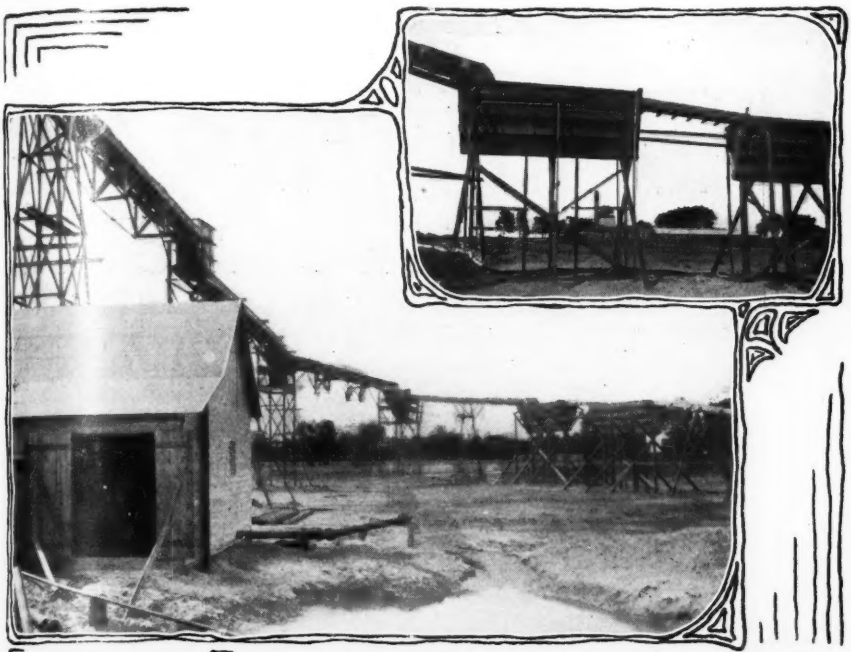
The plant is located about three miles west of Evanston, Ill., and as will be seen from the illustrations, is of the flume type. The material is obtained from a flooded pit, by means of an 8-inch Morris centrifrugal pump, driven by an 80 H.P. Venn Severin Oil Engine. It is pumped up to an elevated flume, which carries it downhill to an inclined screen, which removes the coarse gravel. This gravel drops into a bin, from which it is loaded into trucks by means of chutes.

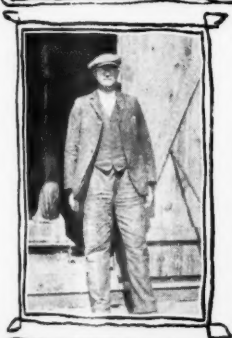
After the gravel is removed, the material then travels on to the second screen, which removes the fine gravel. This drops into a wooden cone, designed by Mr. Schockweiler, which discharges when filled to a certain weight. This is repeated for each size of material produced, and the water, after all the material is taken from it, flows back to the pit.

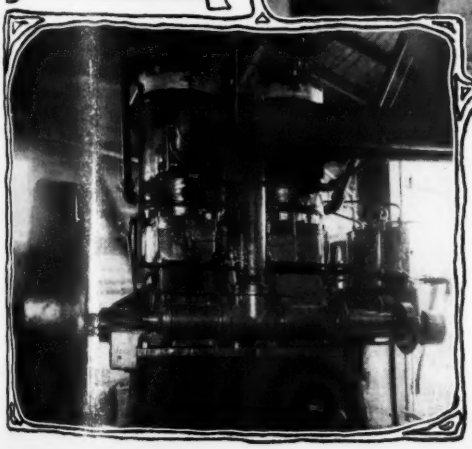
Mr. Schockweiler operates five motor trucks, and sells his material to local contractors. He has a very good gravel deposit, and produces a high grade, accurately sized material.

The Orgeon State lime plant opened June 25th.

The lime will be sold in carload lots, probably at between $4.00 and $4.50 a ton.





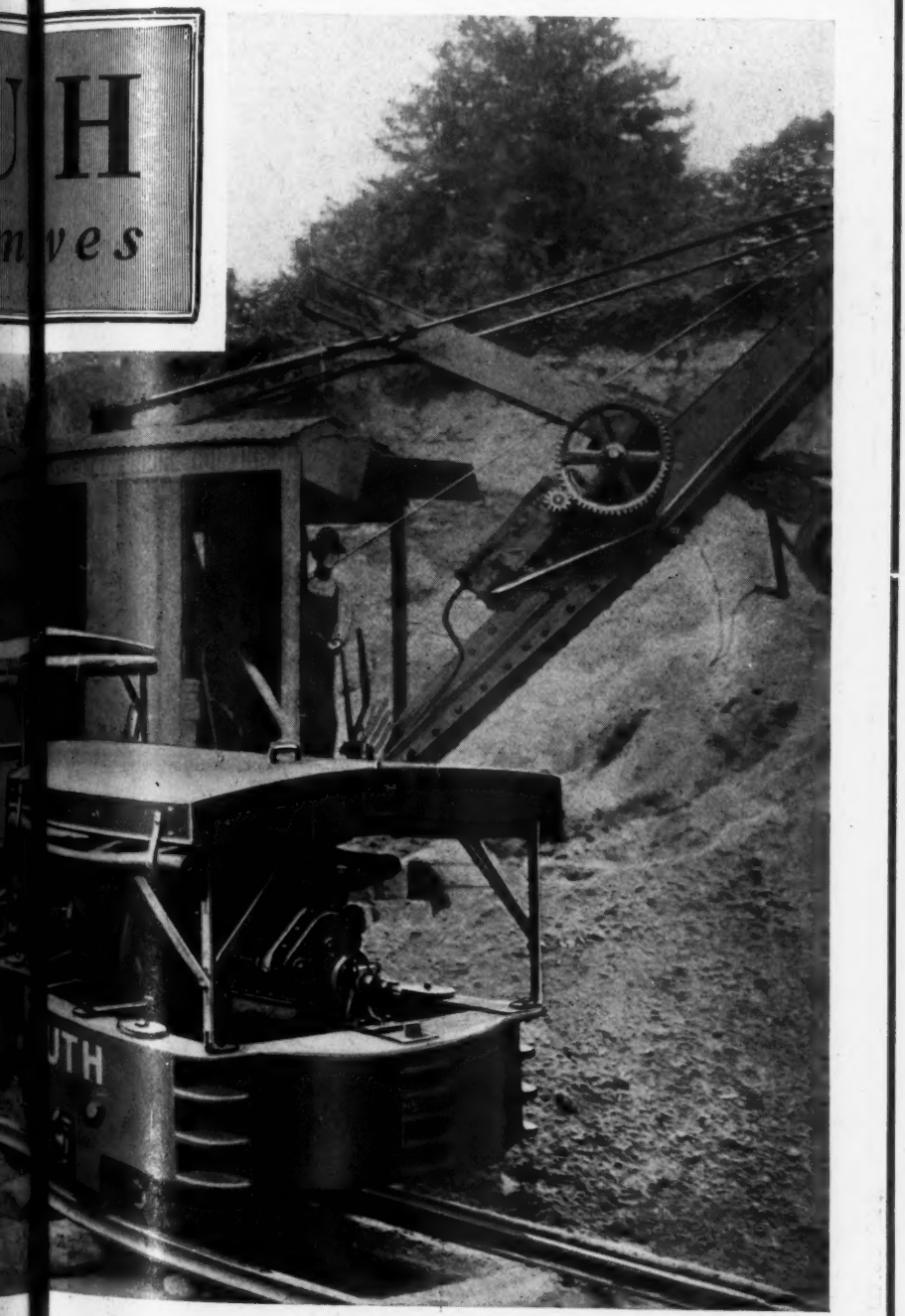


Views of the John Schockweiler Sand & Gravel Plant Evanston, Illinois.

PLYMOUTH

Gasoline Locomotive

The Morris Sand Co., of Morristown, N. J., installed a PLYMOUTH Gasoline Locomotive. It proved so essential that a half dozen are now increasing production and profit. Ask for Bulletin. The FATE-ROOT-HEATH CO., Plymouth, O.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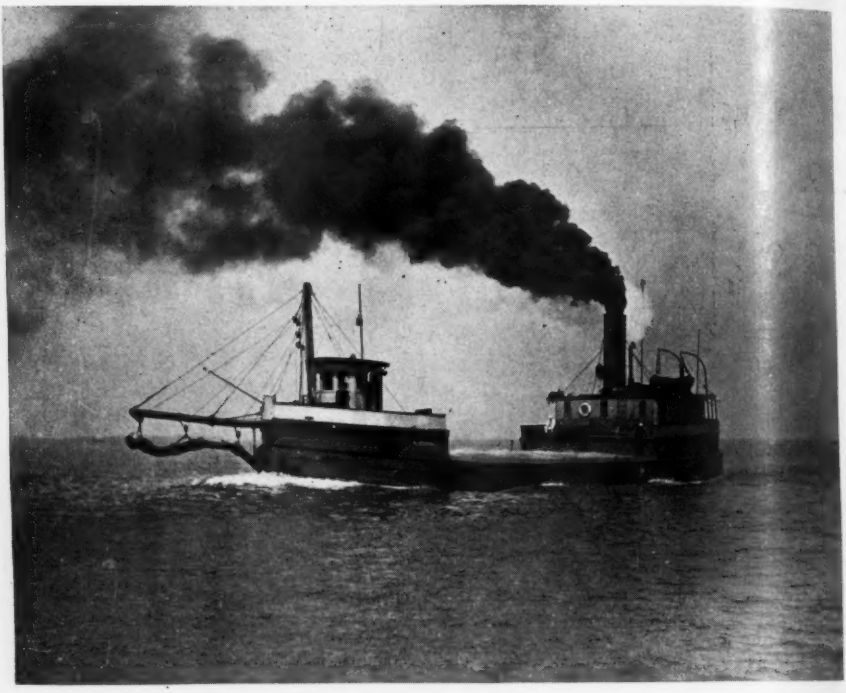
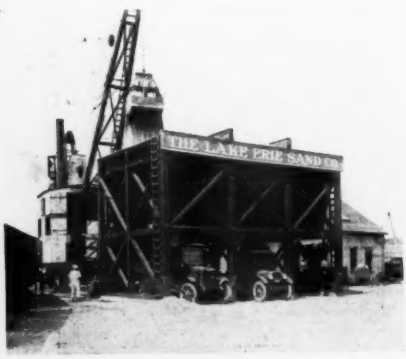


One of the dredges of the Lake Erie Sand Co.

Views of The Lake Erie Sand Co., Sandusky, O.



McMyler crane filling the loading hopper.

Intake end of hose being lowered in lake.

Getting Sand From Lake Erie

Sandusky Concern Gets Big Tonnage with Hydraulic Dredges

THE Lake Erie Sand Company of Sandusky, Ohio, is so different from the ordinary sand plant that a story of it should be interesting.

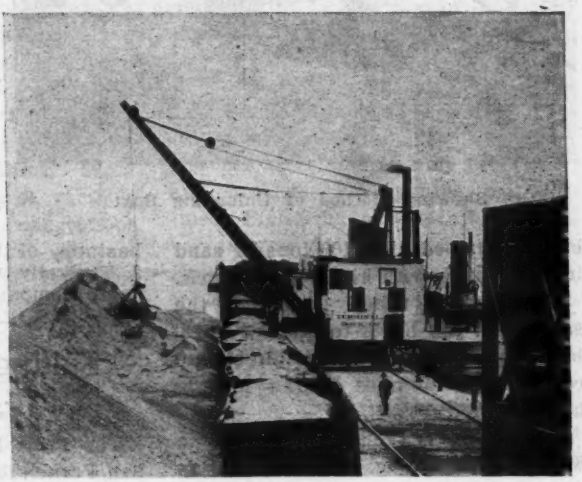
Sandusky is located on Sanduky Bay, at the wetern end of Lake Erie, and the Lake Erie Sand Company owns two docks and two hydraulic dredges, with complete equipment for handling the sand in the latest and most efficient manner.

The two dredges are mammoth affairs, as can be seen in the accompanying photographs. They steam out of the harbor every morning at about 4 o'clock—out through the bay and into Lake Erie about twenty-five miles.

Here they stay nearly all day—until they are filled to capacity, which is about 1,400 tons. When they go out, they look like any ordinary large freighter, but when they come in loaded, they are so low in the water that all you can see is the pilot house and smoke stack.

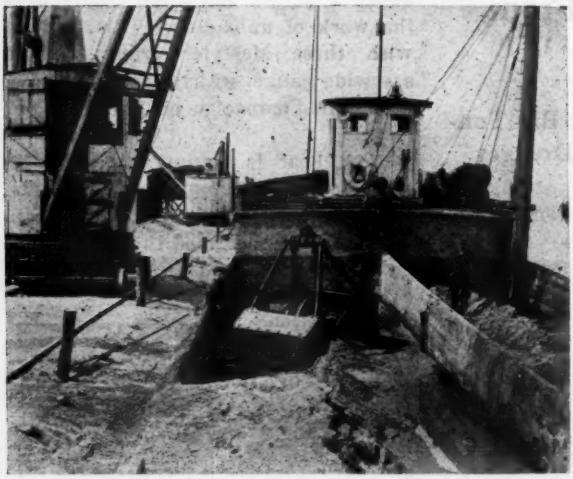
The boats usually get in to dock at about 3 p. m., and then commences the work of unloading. This is done with three McMyler cranes. These are wide gauge, whirly type, and have a handling capacity of 200 tons per hour.

Each boat is equipped with a 12-inch Morris centrifugal pump, and Mr. H. J. Gerhardstein, the general manager, proudly informed the writer that he held the record in that locality,



McMyler Crane Loading Cars from Stock Pile

Flume Distributes Material Evenly on Boat



Showing Method of Unloading Boat

having pumped over 400 tons of sand in 29 minutes with his 12-inch Morris.

The cranes usually transfer the sand from the boats to storage piles, but sometimes they load it direct into cars, and sometimes into a loading hopper, for trucks.

The sand, of course, requires no washing or grading. The capacity is about 50 cars a day for each dock.

Mr. Gerhardstein is also executive secretary of the Lake Producers' Association, composed of producers who get their material from the lake.

Hercules Buys Aetna

Rumors of the proposed purchase of the Aetna Explosives Company, Inc., by the Hercules Powder Company received definite confirmation within the past month when the Aetna stockholders sanctioned the sale of its properties, assets, and business. This marks the culmination of a transaction that has interested financial and business circles for the past two years.

The explosives industry differs from most others in that it is limited geographically in making sales because of freight rates. It is only possible to ship such commodities a limited distance from the place of manufacture before a point is reached at which transportation costs make it impossible to compete with other companies having plants nearer the particular consuming center. The principal significance of this transaction to the Hercules Company is that it will in the future, because of the location of the Aetna plants, be able to enter territories in which it has previously found it unprofitable to sell. It will thereby compete all the more successfully with other explosives manufacturers.

"With the Aetna Company's business, the Hercules Powder Company becomes a much larger factor in the explosives business of the United States," said J. T. Skelly, vice-president of the Hercules Company.

Selling Sand with a Trade Name

The Pratt Building Material Co., of San Francisco are conducting a $50.00 prize contest to secure a trade name for the sand produced by a new plant they have just opened.

Extracts from a letter from Mr. Pratt to PIT AND QUARRY will best tell the story.

"We sent out 2,244 letters offering $50.00 in prizes for a name for our sand. To date 97 people have sent in answers. Over 200 persons in the building world have mentioned receiving the letters. We have some wonderful suggestions for trade names.

"We will start shipping in about one week and already the sand is as well known as any sand in California.

"We enjoy PIT AND QUARRY. Four or five of our crowd read it. Business is on the improve."

"Signed: Clarence F. Pratt."

The Magnolia Gravel Co., at Dallas, Texas, has organized with a capital stock of $5,100.00.

Lime Association Holds Highly Successful Meeting

Fine Attendance with Equally Fine Program—Lime Industry on a Solid Foundation.—Prepared for Big Increase in Business

THE third annual convention of the National Lime Association will go down on the record as one of the most successful gatherings of the organization. From the time of the roll call on Wednesday morning until adjournment on Friday afternoon, June 17, real helpful action and enjoyable fellowship prevailed. There was "something doing" every moment, and a multitude of valuable thoughts, opinions and suggestions were expounded during the different sessions. Fortunate were the lime men who were in attendance and, on the other hand, unfortunate were those who could not be present. They missed far more than the average absentee at the average meeting.

The 1921 convention followed closely the lines laid down at previous meetings, and incidentally, this gathering, while the third of the national organization, was the nineteenth annual meeting of lime manufacturers. The meeting was held at the Hotel Commodore, New York, where the West Ballroom was reserved for the purpose. The program was scheduled on a time basis, and with but a few exceptions, the arrangement as decided upon was well maintained. The program was varied and interesting, and very comprehensive. Every phase of the lime industry came in for mention at one time or another, and whether the listener was engaged in the technical or commercial side of the business, he was sure to find some part of the program exactly fitting his sphere.

For two days previous to the general meeting, executives of the association held a number of private sessions, Monday, June 13, being given over to a meeting of the Budget Committee, and Tuesday to a session of the Board of Directors.

First Day of the Convention

At the general sessions on the first day of the convention, the papers and discussions related to lime production and problems surrounding manufacture. Following a roll call of member companies by Secretary Elmer O. Fippin and response by those present, with names of representatives in attendance, President Charles Warner spoke a few appropriate words of welcome to those convened and commented on the broad and interesting program as arranged. He expressed the opinion and wish that all would leave the convention at the close well repaid for the time and attention given to the gathering.

And from this time on, real action and business were the order of the day.

Kiln Efficiency

The first paper on the program was by Richard K. Meade, chemical and industrial engineer, Baltimore, Md., on the subject of "Kiln Efficiency."

Mr. Meade explained some of the fundamentals of kiln construction and brought out points of recent development. He mentioned the need for some radical changes that must come about to secure greater fuel efficiency; in the average kiln under usual operation, he said that but about 33 per cent of the heating value of the fuel was obtained, and that the balance, approximately 64 per cent, was wasted.

This brought out reference to insulation and the need for the use of really good insulating materials in connection with lime kiln work. With regard to kiln firing, he said that mechanical stokers do not show, up to the present time, the necessary economy, and that the human element, the kiln tender, must still be considered and properly instructed.

A number of interesting lantern slides were shown during the course of the address, and among these, several views of the plant of the Eastern Potash Corporation now being erected at New Brunswick, N. J., and described quite fully in an illustrated article in the June issue of PIT AND QUARRY. Mr. Meade has been acting as engineer in connection with this project.

Chemical Control in Kiln Operation

Following the first speaker, W. D. Mount, M. E., consulting engineer, Lynchburg, Va., gave an interesting technical paper termed "Chemical Control, the Key to Kiln Efficiency," bringing out a number of illuminating points on this subject.

This paper, which will be printed in full in an early issue of PIT AND QUARRY, introduced the topic with a brief outline of the manufacture of sodium carbonate, or the soda ash of commerce, produced under the ammonia process, and a short but comprehensive description of such process was given. It was pointed out that while not generally known, alkali manufacturers are among the largest, if not the largest, individual producers of lime, the material being utilized in the manufacture of alkali.

The usual type of lime kilns as employed in an ammonia soda plant were explained, supplemented by two large sectional views of kilns mounted on the wall of the room; these kilns were of the Mount design. Mr. Mount said that it would seem axiomatic that a kiln of the shaft type, other things being equal, will have the highest fuel economy when operated so as to be cold at the top and cold at the bottom, and its capacity under these conditions will be greatest when discharging continuously.

It was stated in the paper that a kiln is most efficient as regards fuel consumption where the fuel is burned in direct contact with the stone, and further, that an efficient kiln is perfectly regenerative in action, the entire heat being conserved.

Taking available statistics for 1918, it was shown that the commercial lime produced in the country in that year approximated 3,204,000 tons, and including that manufactured by the alkali plants, 4,829,000 tons. From this it is seen that the alkali industry produced about one-third of the grand total, or, in other words, the lime used by alkali manufacturers was equal to one-half of that burned for commercial purposes.

Therefore, the conclusion naturally to be drawn is that the argument for chemical control in the burning of lime is worthy of utmost consideration, when it represents the best practice of an industry using a tonnage equal to one-half of the output of lime for commercial purposes.

The Fine Art of Lime Burning

The final paper of the morning session was on the "Fine Art of Lime Burning," by George B. Wood, president and general manager of the Rockland & Rockport Lime Corporation, Rockland, Me. The address covered a description of the new plant of the company, and substantially as appeared in the June issue of PIT AND QUARRY.

Mr. Wood supplemented his paper by a few humorous remarks with regard to the time-worn phrase that "lump lime must be slacked a week before using," and set forth, in his opinion, how fallacious this is. Hot lime, he said, is used every day in New York

and other cities, and with entire success. All lime troubles are to be attributed to improper burning.

In a brief discussion which followed this paper, it was brought out that it is expected to operate the Rockland plant under a capacity of 300 tons in 24 hours, with a working force of not more than 16 men.

Committees Appointed

Just prior to the adjournment for luncheon, President Warner handled a few matters of important business, covering the appointment of a nominating committee, and also arranging for a committee on resolutions.

While Mr. Warner urged that the nominating committee be selected from the floor, it was insisted that the chair appoint such committee, and Messrs. Wilton, Cheney and Mathews were appointed to so act. Suggestions were also made for the committee on resolutions, such committee being appointed later.

Complimentary Luncheons

The broad-minded attitude of the association is shown in its arrangement for complimentary luncheons for those assembled during the entire convention, or for each day of the three-day period. The buffet luncheons were enjoyed heartily, and served to keep the delegates well together, with fine opportunity for talking "shop."

Immediately following the Wednesday luncheon, Dr. S. W. Stratton, director, United States Bureau of Standards, Washington, D. C., gave an interesting résumé of some of the work now going on at the bureau, with his talk entitled "Standardization—Government Research and Industrial Development." He spoke of the value of standardization work, showing how the results accrue to the manufacturer in his everyday plant operation. Cooperation with the bureau was urged, as it is only in this way that desired ends can be secured.

Quarry Operations

The afternoon session was opened with a highly interesting and instructive paper by Irving Warner, plant manager, the Charles Warner Company, Wilmington, Del., entitled "Problems to Be Considered in Changing a Quarry from Hand to Steam Shovel Methods," and which will be printed in full in an early issue of PIT AND QUARRY. The subject was handled in an able manner by Mr. Warner, with a conclusion carrying a particular application to the manufacturer of lime.

The paper was considered under five subheads, these being: (1) The quarry, with two subdivisions as (a) Nature of Stone, and (b) Height of the Quarry Face; (2) Size and type of shovel; (3) Transportation system; (4) Crusher; and (5) Special problems of the lime manufacturer.

Under the first topic it was pointed out that no one should consider a change in his quarry from hand methods to steam shovel without making a thorough examination of the practice and equipment at various plants, and further, to the character of the rock in the quarry where such a change is contemplated.

A face of less than 40 feet is preferable for any size of shovel, and since the quarry face is of a uniform curvature, the development consists of a gradual spiraling out, bringing high efficiency of operation. The higher the face, the greater is the tendency for the stone to come out insufficiently shattered, and therefore it is not desirable to drill the holes back at a considerable distance from the front, which would tend to aggravate the condition.

It was brought out that the best size and type of steam shovel for quarrying service is the railway shovel running on a track, mounted on eight wheels, and with dipper capacity of about 3 yards. Under certain oper-

The official photograph serves to show the

ating conditions, small shovels on traction wheels offer attractive possibilities.

With regard to crushers, it was pointed out that a majority of installations have equipment of this kind too small for the purpose intended. On the other hand, the gyratory crusher only should be considered where an enormous output is desired, say 4,000 tons or more per day.

In conclusion, Mr. Warner said that from the broad viewpoint, sooner or later all stone will be produced by machine methods, except in small operations.

Banking Service for Employes

Following Mr. Warner, an illuminating paper was presented by Willard A. Eckman, welfare specialist, United Security Life Insurance & Trust Company, Philadelphia, Pa., captioned "Relations of Banking Institutions to Social Service."

This address made a strong plea for the necessity to educate the employe in the principles of banking and finance, and urged employers to provide banking service for their workers in a logical way that would go to teach the habit of thrift. The advantages of owning a home were brought out, showing that employes inspired with this desire become better workers in the long run, and the incentives of home owning and thrift lead to increase in efficiency and improved morale. A number of specific instances were cited showing how the employer can arrange for a home-building plan for workers at his plant, securing mortgage money accommodation and other essential features.

Social Service Applied to the Lime Industry

Following up the same theme of welfare, E. J. Heimerdinger, assistant to the President, Louisville Cement Company, Louisville, Ky., made many pertinent comments in an address entitled "Social Service Applied to the Lime Industry." He showed the far-reaching benefits accruing to the employer who develops character and thrift in his employes, and gave instances of the effectiveness of such work in the lime plant.

Annual Banquet

The first day's business was "topped off" by the annual banquet, called for 6:30 p. m., but starting a little later, as is usually the case with numerous arrangements to be made. The dinner was announced on the program as "a rousing social time with good music, songs and stunts by lime producers," and it lived up to this definition in every sense of the word.

the delegates that they were actually present.

The banquet menu was arranged in a clever fashion; with two pages facing, the left hand carried the "Menu—as it is," and on the opposite page, "As it might have been." Here, in corresponding order, item for item, as appeared in the regular menu, were set forth trade terms applicable to the reference; for instance, the salad course was listed as "Mortar Salad, dressing 1, fruit 2½, lettuce 5"; and for dessert, "Horizontal strata with overburden."

There was music, and then some; many popular songs, with special words applicable to the lime industry, as "Keep the Lime Kilns Burning"; "Dear Old Calcium"; and "A Ton of Limestone," the latter sung to the tune of "A Young Man's Fancy." That the songs made a "hit" goes without saying, and the sport was entered into heartily.

George B. Wood acted as toastmaster and was ably seconded in his efforts by a fine list of speakers, who just talked "long enough" and no longer. These included Edward H. Ford, a well-known humorist, who kept those assembled in an uproar. Charles Warner had a few remarks under the head of "Wise and Otherwise," and H. B. Warner, "Mangling vs. Managing Sales," with A. P. McCallie and others following.

All in all, it was "some" dinner and "some" evening, and will not be forgotten easily by those privileged to be present.

Thursday Session

The Thursday meetings were given over to papers and talks dealing with the extension of the use of lime, and many interesting and valuable expressions and viewpoints were gleaned during the sessions.

Following a brief symposium on different points of merit of lump lime, K. Knickerbacker Boyd, well-known architect of Philadelphia, Pa., spoke on the subject of "An Architect's View of Lime and Its Use." He mentioned the broad utility of lump lime and its efficiency in building service when handled in the proper manner. His plea was for broader and more intimate knowledge of this basic product in the building industry, and he urged producers to let no opportunity pass to advance the merits of the product with architects who were inclined towards other character of mortars.

Wet Mixed Lime Mortar

W. C. Hay, vice-president and general manager of the Blue Diamond Plaster Co., Los Angeles, Cal., followed Mr. Boyd, with one of the most interesting and enlightening talks of the gathering. Covering a history of the

wet-mixed mortar business in the United States, the paper was entitled, "Wet Mixed Lime Mortar—A Chapter of Successful Experience," and will appear in full in an early issue of PIT AND QUARRY.

Mr. Hay introduced his subject by speaking of the rather deep-seated prejudice that has grown up in the minds of many lime manufacturers, masons' material dealers and others against wet-mixing plants, owing to the trouble obtaining through lack of knowledge, in handling operations. In dwelling on the failures, he said that these were due to such reasons as:

(1) General arrangement of plant too cumbersome, with size and cost entirely out of proportion to the ability to turn out the finished product; (2) Too much weight supported above ground; (3) Excessive machinery installations of improper type; (4) Lack of proper facilities for storing or feeding the lime to the slackers, resulting in extra labor expense; (5) Lack of proper facilities for storing or feeding the sand to the mixers, resulting in extra labor expense; (6) No proper means provided for handling aged or cured lime putty, resulting in extra labor expense; (7) Poor slacking method; (8) Poor mixing methods; (9) Poor delivery methods; and (10) Most important economic features overlooked, viz.: aerating of cured lime putty.

The speaker mentioned some of the early plants placed in operation, leading to the development of improved and logical methods, and the establishment of such mortar works on the Pacific Coast. The success of these plants has spread. and the company with which Mr. Hay is connected does the largest masons' material business in the west today, its activities including manufacturing, wholesaling and retailing. The approximate daily tonnage is 70 carloads.

Mr. Hay described the different features of operation of his company and spoke of the highly successful plant accomplishments under the Hay process of production. He said that these plants were successful because they are producing better mortar at considerable less cost than the contractor can obtain under usual methods.

It was pointed out that the aeration of the cured lime putty is, without doubt, the greatest advance made in the line of the production of ready-mixed mortar. By violently agitating the cured lime putty, it is given a spreading ability of upwards of 25 per cent of its former stretch, and at the same time, this agitation eliminates any excessive labor charges for handling the material, and as formerly required.

A Large and Progressive Company

The concluding talk of the morning session was by A. P. McCallie, sales manager of the Kelley Island Lime & Transport Co., Cleveland, Ohio, and described the activities of this large organization. The subject matter was termed, "Building up and Management of District Mailing Lists," and a number of valuable suggestions were set forth in connection with work of this nature.

The address was illustrated with motion pictures, showing different views of the plants of the company, and dwelling for the most part on the extensive lime manufacturing works now being operated.

A Fine Luncheon

The usual fine luncheon was served, with an interesting talk during the recess from the convention. Just prior to the gathering in the luncheon room on the ballroom floor, a photograph was taken of the delegates and guests, reproduced in this issue of PIT AND QUARRY. Many familiar faces of men prominent in the lime industry will be noted.

The afternoon session was opened

with an interesting talk by Tom Wright, manager, Building Materials Corporation, Rochester, N. Y., and well-known in this section through his former connection as secretary of the New York State Building Supply Dealers' Association. Mr. Wright's talk was entitled, "Delivering the Goods; the Dealer's Viewpoint."

He spoke of the important position occupied by the building supply dealer and the influence he had in lining up trade in his territory. He is the connecting link between the manufacturer and the consumer, and of necessity, from the standpoint of the lime producer, should be educated thoroughly in the utility of lime for different phases of operation.

Mr. Wright urged those present to enlighten their salesmen with regard to the commodity they were handling, saying that many representatives for lime manufacturers seemed to know more about cement than lime. This, he pointed out, reacts in a serious and wrong way when the dealer and his importance in his community are cosidered. He recommended advertising to the greatest possible extent, both direct and otherwise—any way to reach the material dealer and give him proper knowledge and instruction of the merits of lime, not only for building service, but for agricultural use, and other purposes. Lack of proper information is, in his opinion, a stumbling block that can only be overcome with concerted, enthusiastic and proper activities.

Value of Research

An illuminating talk on the value of research, under the title of, "The Dependence of Modern Industry on Research," was given by Arthur D. Little, president of the consulting industrial chemical company of this name at Cambridge, Mass. The importance of research work in the lime industry was emphasized, and the resulting benefits pointed out. Proper research is not an expense, but a judicious investment, and will pay for itself many, many fold in the long run.

Following Mr. Little, the agricultural phase of the industry was dwelt upon by Dr. W. H. MacIntire, soil chemist, Agricultural Experiment Station, Knoxville, Tenn., with an address termed, "Why is a Soil Chemist? or Getting Facts about Lime in the Soil." He brought out a number of pertinent references regarding the vital need of lime in connection with agricultural pursuits, and the necessity for the right line of education in this field.

Measurement of Plasticity

Warren E. Emley, Bureau of Standards, Washington, D. C., always a familiar figure at the lime conventions, gave a short, interesting paper on the subject of "The Measurement of Plasticity," as the concluding address of the Thursday afternoon session. This paper will appear in an early issue of PIT AND QUARRY.

He said that plasticity is a very important property of hydrated lime, and that consumers are willing to pay an additional cost for assurance of this qualification. A standard of plasticity is necessary, and which will not only be beneficial from a business standpoint, but facilitate investigations in this direction. He demonstrated the use of the plasticimeter, as employed for this purpose, and referred to published papers by the Bureau for additional information. The primary purpose of the instrument, as is generally known, is to measure the relative plasticities of different hydrates.

He spoke of a number of interesting experiments made by E. E. Eakins of the Charles Warner Co., and said that as a result it is shown that it is not only possible to make a finishing hydrate, but to control the plasticity of the product.

In conclusion, he said that the plasticimeter is a new tool which can be used for the study of the plasticity of

building materials with high effectiveness, and to the ultimate advantage of the lime manufacturer. He urged a comprehensive knowledge on the subject.

Friday Session

The final sessions of the convention on Friday were devoted, for the most part, to association work and activities, with a brief review of the accomplishments, technical and otherwise, during the past year.

The first business on the program was that of the secretary's report, and this proved quite a lengthy, but exceedingly valuable resumé of just what has been going on during the past twelve months. Mr. Fippin, secretary and manager, is to be congratulated upon the able manner in which he is handling association affairs, and that his work and efforts are appreciated is shown by the applause which greeted his remarks.

President's Report

Following Mr. Fippin, President Charles Warner made an interesting and valuable report to those assembled, hearing the address as "What of the Future?" He spoke with an intimate knowledge of the industry and the problems now confronting it, and the spirit of his talk can be summed up with the phrase: "Co-operation."

Mr. Warner's address is reprinted in full in this issue of PIT AND QUARRY.

Technical Discussions

A number of short pertinent talks were made on technical phases of the industry during the morning session, showing accomplishments during the past year, as well as plans for the coming twelve months. These included references to "Construction," by L. H. Hart; "Chemistry," by Dr. M. E. Holmes, manager; and "Agriculture," by J. A. Slipher. Each topic was handled in an able manner by the speakers, bringing out some valuable data for the listeners.

Henry M. Camp, director of the Eastern Bureau of the association, spoke on some of the features of the work now going forward, and T. B. Shertzer, field engineer of the Eastern Bureau, followed with some interesting comments on the growing use of lime in the different communities and cities.

"Agricultural Lime from the New England Slant" was the subject of the succeeding paper, by R. C. Parker, agronomist of the Eastern Bureau. He dwelt on the activities and accomplishments with respect to the agricultural colleges and experiment stations, and a large number of visits made to institutions of this kind during the past year. Lime has been supplied for demonstration purposes and record cards made of the results of different tests on lime analyses. He spoke in an optimistic way for the future, and said that the fundamental work that has gone forward was molding public opinion in the right way.

Other speakers of the morning session were C. O. Dowell, field engineer of the Central Bureau, St. Louis, Mo., who mentioned different interesting experiences, and H. L. Brickell, field representative of the Construction Department, on a similar topic, with specific regard to proper promotion of lime for use in the building industry. A number of interesting discussions followed the different presentations.

Election of Officers

As was almost to be expected, the election of officers resulted in the unanimous decision to have the present incumbents hold their offices. The different officials have filled their positions with great credit and with decided benefit to the members, so when the nominating committee brought in its findings in this line, it was the universal choice of those assembled. The three officers re-elected are: Charles Warner, president, head of the Charles

Warner Company, Wilmington, Del.; C. J. Nicholson, vice-president, of the White Marble Lime Company, Manistique, Mich.; and A. H. Lauman, treasurer, connected with the National Mortar & Supply Company, Pittsburgh, Pa. The district officers will remain substantially the same during the coming year, the matter of appointment being vested in the particular company members operating in the respective districts, of which there are 14 under the present organization arrangements.

Resolutions

The Resolution Committee brought in two resolutions for the consideration of the convention, and these were adopted unanimously. It was provided that a special committee from the association present the resolutions to the President, Vice-President and the Speaker of the House at Washington within the next few days.

The first resolution covered the following:

Resolved, that in view of present distressed business conditions, that governmental bodies do all they can by legislation to relieve and set business into motion again; approving of a reorganization of different governmental departments in a way to function to the best advantage; endorsing the program of Herbert Hoover in the reorganization of the different Departments of Commerce, so that it can increase the efficiency, and bring lower cost of operation in the service to business; endorsing Mr. Hoover's policy of co-operation with business in its different branches; endorsing his policy of bringing about standardization and simplified construction methods in all parts of the country; and urging that the transportation and railroad situation be cleared up at the earliest possible date.

The second resolution adopted urged the placing in force of permanent legislation for the protection of the dye industries in the United States, for the benefit of the chemical industries and for national defense.

Convention Adjourns

Prior to the adjournment, a vote of thanks was given to the different speakers at the convention, and the motion to call the gathering to an end brought a conclusion to a three-day meeting of great profit and benefit to those in attendance. The 1921 convention of the National Lime Association will be one that participants long will remember. It spelled success with a big "S," and set a mark that future conventions must strive hard to parallel.

Finds Fortune Digging Cellar

Mr. C. F. Cooley, coal dealer of Madison, Wis., owns a large farm at North Freedom, Wis. He was digging a vegetable cellar there recently, and discovered a very fine deposit of high grade moulder's sand.

State Geologist W. O. Hotchkiss and Mr. Cooley made a complete survey of the property, and found there was forty acres of sand, worth about $2.00 a ton.

Foundries in Wisconsin get all their moulding sand from New York, and other distant points, and this discovery will mean a great saving in freight charges, and will prove exceedingly valuable to its owner.

The Nebraska Cement Co., of Superior, Neb., is running on full time, and with a full force of men. The company has never reduced its force, or wages, and has lately completed a score of attractive bungalows for its workers.

The International Cement Corp'n. and subsidiary companies, show a net income for 1920 of $1,779,559, as against $317,603 for 1919. All of the plants of this company burn fuel oil instead of coal, and H. Struckman, president, believes it is responsible to a certain extent, for the increased earnings.

Arranging A Pipe Line for Sluicing

BY DANIEL J. HAUER.

IN ALL hydraulic handling of materials, the first essential is the pump. There must not only be a large amount of water, but there must be sufficient force to the water to cut away earth and rock. The pump must supply both the pressure and the water, unless both are obtained by gravity.

This can be done only in mountainous sections of the country, where water in sufficient quantities can be obtained high above the work to be done, and brought down in pipes. The writer once brought water down a mountain side for a vertical drop of 1,500 feet, to be used for hydraulic sluicing, and had a force sufficient to cut out seamy rock and carry it down the slope to a catch basin. Boulders containing several cubic yards were so handled before being broken up with dynamite.

Naturally, for hydraulic work sufficient gravity flow is desirable, but as this can seldom be obtained, pumps are necessary. Any high power pumps of large capacity can be used for this work.

The amount of water needed will vary with the kind of material and the amount to be transported in a day. The amount of solids carried by water will vary from about 5 per cent to 45 or 50 per cent.

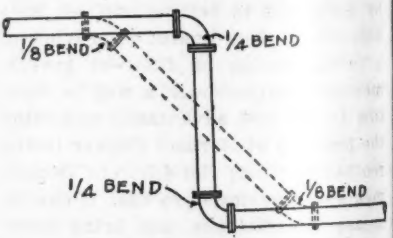
Sand is the easiest material moved, and water will often carry as much as 40 to 50 per cent solids under the most favorable circumstances. It takes a much greater volume of water to excavate and carry gravel. The light soils and clays will sometimes run from 20 to 35 per cent solids, while the heavy clays, unless the material readily balls up, will run as low as 5 or 10 per cent. If the clay is cut out in chunks so it becomes round like a ball or boulder, the water will carry a larger percentage, often as much as 20 to 25 per cent.

In estimating the amount of water, it is safe to figure from 10 to 30 per cent of solids, according to the class of material.

A cubic foot of water has approximately 7.5 gallons in it. Thus a cubic yard will be, roughly, 202 gallons. A thousand cubic yards of water equals 202,000 gallons. Thus, if water is carrying 25 per cent solids, and it is desired to move 1,000 cubic yards of earth in 10 hours, it means that there must be pumped 3,000 cubic yards of water, or 606,000 gallons, capable of doing slightly more than 1,000 gallons of water per minute.

This gives some idea of the water necessary to excavate and carry earth. Naturally, economical work can be done moving much less than a thousand cubic yards per day.

There are two types of pumps that will readily furnish the requisite



amount of water for such operations and will likewise give the pressure for excavation. These are duplex pumps and centrifugal. Duplex pumps are preferred by some operators, and there is little doubt that high pressure can be obtained from them, and the water raised to considerable elevation.

Centrifugal pumps have a greater range of use around pit and quarry operation. Not only can they furnish water for sluicing processes and the

transportating of materials, as well as unwatering pits and furnishing water for washing and other purposes, but centrifugal pumps can be used for dredging and sucking sand and gravel through them. Naturally, a duplex pump must be kept free of all sand or its valves will not work and the pump becomes so worn as to do poor work.

In order to keep the pressure at the discharge end of the pipe at the maximum, there must be as few bends or elbows in it as possible. These pipes are run on the ground or in shallow trenches, so it is an easy matter to keep the bends at the minimum and likewise to use one-eighth bends instead of quarter bends, which means less friction.

The accompanying sketch shows how eighth bends are readily used. The heavy line shows a pipe line with quarter bends in it, while the dotted line shows eighth bends and how pipe is saved in laying the line. The bends not only mean to maintain a higher pressure but also the shortening of the entire line means less friction, therefore greater pressure.

A better method, if it is possible to use it, is to make long bends or sweeps in a length of pipe. There are pipe bending machines that can be purchased for this work, especially for large size pipe, for there is not likely to be more than half a dozen lengths to be bent, or it would be cheaper to have these bent at some shop equipped to do the work. It is also possible to heat pipe and bend it around some large, round obstacle, but care must be exercised not to kink it, otherwise it is worse than having an ell in the pipe.

It must be understood that when pipe is bent in this manner, a union coupling must be used, or a flange joint, as it is not possible to screw such a length into the pipe line.

Even at some expense, the size of the pipe between the pump and the monitor should not be reduced. Carry the same diameter of pipe until the reduction is made to connect into the monitor. To reduce the size means by friction to quickly use up the pressure available for work. The pipe line must also be maintained in good shape without leaks, if the pressure is to be kept at the maximum.

Railway Ballast

In one of the many press bulletins issued by the association of railway executives there is one explaining the heavy cost of maintenance in 1920, from which we may quote the following as pertaining to ballast:

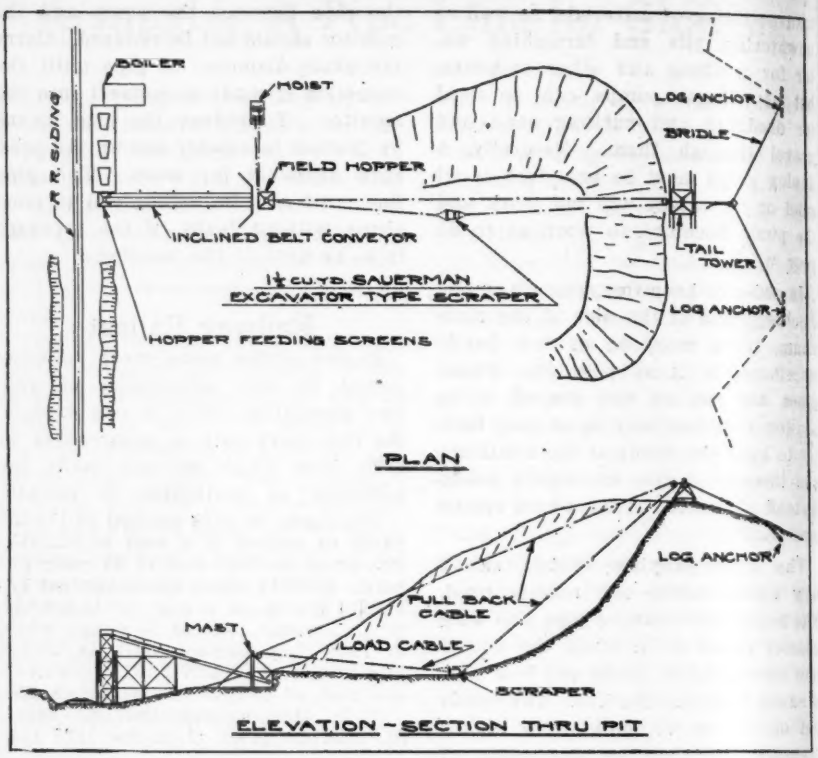
The roads in 1920 applied 19,118,553 yards of ballast at a cost of $12,045,000, or an average cost of 63 cents per yard. In 1919 these roads applied 17,518,791 yards at a cost of $9,481,545, or an average cost of 54 cents, while in 1918 they applied only 14,796,252 at a total cost of $6,472,151 or an average cost of 43-7/10 cents per yard.

It is true enough that 63 cents, the average price given for 1920 railway ballast, is high as compared to the 1918 price, but the trouble with it all is that railway ballast has never sold for the price it should in comparison with commercial crushed stone.

The capitalization of the Ralph Gypsum Company, Akron, N. Y., has been increased from $200,000 to $1,500,000.

The Quincy Quarries Owners Producing Co., Boston, Mass., has been incorporated with a capital stock of $250,000. The incorporators are: John A. Galvin and Daniel E. Murray, both of Boston.

On account of the vast amount of Belgian cement needed in the interior and France, Belgium was unable to export to other countries. However, now that the Belgium cement manufacturers have greatly increased production, large quantities are being sent to Porto Rico, the United States and elsewhere.



Showing Layout of Sioux Falls Sand Co.'s Plant for Working Hillside Gravel Deposit

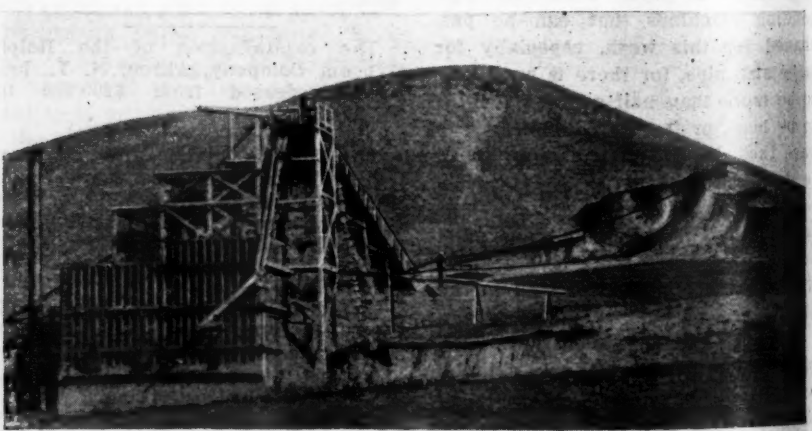


Photo taken Two Weeks After Plant Started Operations

Mountain of Gravel

Sioux Falls Plant Tearing It Down for Commercial Purposes

THE Sioux Falls Sand Company, of Sioux Falls, S. D., has a hill of gravel 125 feet high, and covering 25 acres. There is only about one foot of overburden, making the material very accessible.

The screening and washing plant is built at the bottom of the hill, and the material is brought to it by a Sauerman 1½-yard power scraper, operated by a 100 horsepower steam hoist. This discharges to a hopper which is built in a tunnel at the lower end of a 24-inch belt conveyor.

The material is then taken by the belt conveyor to the top of the plant from whence it discharges by means of chutes to a double battery of Gilbert screens. Gravel from ¼-inch to 1½-inch is screened out, and the sand passing the ¼-inch screen is washed by two Stephens-Adamson automatic settling tanks.

A 5-inch centrifugal pump delivers 600 gallons of water a minute to the wash house, obtaining it from a well 100 feet deep.

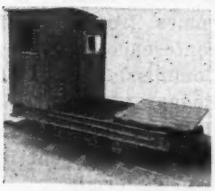
The entire plant is powered by steam, using a single 150 horsepower boiler.

The company owns siding with a capacity of 34 cars, switching to the Chicago, Milwaukee and St. Paul R. R.

Mr. Delbert Wheeler is manager of the concern, having formerly been connected with the Le Mars Gravel Company.

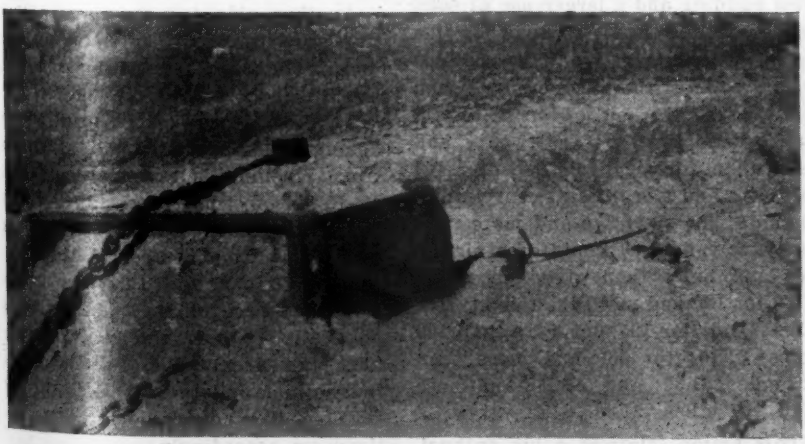
Storage Battery Locomotive

The Pottstown Steel Company, of Douglasville, Pa., are manufacturing an Electric Storage Battery Locomotive which they believe is especially well adapted to pit and quarry use. It is compact, well built, has ample traction, and the batteries are of exceptionally long life.



Following are some of the special features: Weight complete, 6,500 pounds; performance, will haul a load of 10,000 pounds on the deck at a speed of 7.8 miles per hour, on straight level track for 27 miles. It will haul 10,000 pounds up a 7½ per cent grade at 3.5 miles per hour.

The locomotive is very easy to operate, has powerful band brakes, and sanders for all four wheels.



"Close up" of Sauerman Excavator Bringing Load to Ground-hopper at Plant

Kentucky Lowers Rates

Report of 25 Per Cent Reduction on Materials for Road Building

By Our Louisville Correspondent

QUITE a number of things of special interest to the crushed stone people and sand and gravel people have happened in this section of the country lately. The most recent happening, and one of perhaps the most wide reaching importance locally, is in a report which comes from Frankfort that after a conference with the State Highway Commission and Highway Engineer Boggs, A. R. Smith, of the L. & N. Railroad, has announced a decrease of about 25 per cent in freight rates on road materials.

Inquiry among local sand and gravel people finds them enthusiastic over it, and in some doubt as to whether this is to be a general straight reduction in freight rates, or whether it is a concession made to state undertakings in which the state alone is to benefit in its road building fund. In either case, however, it meets with approval because it points the way to increased road building and a larger use of sand and gravel and crushed stone for this purpose. According to the reports from Frankfort the rate on stone, sand and gravel for a haul of ten miles will be 60 cents the ton; for twenty and more than forty miles, 70 cents; for forty-five and more than twenty miles, 80 cents; for sixty-five and more than forty-five miles, 90 cents; for eighty-five and more than sixty-five miles, $1.00 for 100 and more than eighty-five miles $1.10; for 125 and more than 100 miles, $1.20; for 150 and more than 125 miles, $1.30; and for 175 and more than 150 miles, $1.40.

This action followed a big enthusiastic state meeting of Kentucky road engineers held at the Armory the second week in June. This was held under the auspices of the Kentucky Roads Engineers Association and the delegates were mainly county engineers, judges, magistrates and contractors interested in good roads building in the state. It was a very enthusiastic gathering out of which there was developed a manifest desire for team work and good roads building throughout the state. Many addresses were heard and many technical talks were made and there were side trips and many interesting exhibits at the Armory.

Two local sand and gravel concerns, the Ohio River Sand Co., and the E. T. Slider Co., were hosts for one of the side trips for the delegates to the good roads convention. They took the delegates for a boat ride on the Ohio River and showed them how the good sand and gravel is reclaimed from the river bed. The delegates were taken to view the diggers of both the Ohio River Sand Co., and the E. T. Slider Co., and meantime were entertained with music and refreshments on the boat. That everybody had a good time as well as learned something about how river sand and gravel is dug and prepared goes without saying.

Another side trip taken was that over the roads of Jefferson County and inspection of the crusher plant on the Brownsboro Road.

Another piece of cheerful news among the road building fans comes from Washington and states that J. M. Robinson, who represents the 11th Kentucky District in Congress, has been named to pilot Federal Aid Legislation. Coupled with this is a prediction that two million additional will be available to Kentucky during the next two fiscal years, which means four million dollars to the Federal Aid fund in Kentucky, which begets enthusiasm accordingly.

Meantime there have been some additional street contracts awarded in Louisville, additional contracts being estimated to a total of $149,804. The successful bidders were Henry Bickel, L. R. Figg, and the Louisville Asphalt Co.

With the street making under way very nicely and good roads work going on and also a fair amount of local building there is not much room for complaint among the local sand and gravel people about business conditions. Some of them say that they are not unusually busy but when they take stock of the slower times all around they feel that perhaps they are rather fortunate.

The quarry people are still limited in their production because of the handicap of high freight rates but the break in freight rates announced from Frankfort indicates probable relief that may beget better activity here during the late summer and fall.

Meantime building operations here and throughout the state are gradually gaining headway and assuming something like normal. One of the interesting reports from out in the state is that the Illinois Central Railway will spend a million dollars at Paducah building round houses and extending and improving the yard facilities there.

Over on the Indiana side there is reported the acceptance of a bid by W. O. Sweeney of Jeffersonville to improve the driveway on Spring Street from Court Street to the river and surface it with vitrified brick and a preliminary order to this effect has been made.

The Charles Stone Co., who operates a large limestone quarry at White Hall, Ill., fired a record shot on June 8th. Drilling to a depth of one hundred feet, they put 7½ tons of dynamite in the holes and set it off, loosening 70,000 tons of stone with one blast. The stone will be used for industrial and agricultural purposes.

Everything Favorable But Weather

Texas Cities Report Good Demand for Road Materials

By Our Dallas Correspondent

THE sand and gravel business in Dallas and other Texas cities continues on the up-grade. The demand is increasing and the price remains steady. Building operations in Dallas, Fort Worth and other large Texas cities continues apace, especially in Dallas, which, acording to statistics of building permits issued, is leading the entire Southwest, and these operations naturally are reflected in the gravel market. Highway construction, too, is under way on a large scale, and this produces an unusually heavy demand for gravel.

Weather conditions during the last two weeks have been extremely unfavorable for work in the gravel pits. Rain has fallen nearly every day, and pits are flooded, in many cases so that they can not be worked. In other cases roads leading to gravel pits are practically impassable, and hauling is made extremely difficult except in a limited way.

Some of the larger concerns have their pits equipped with pumps for keeping water out and others have natural drainage. These concerns, especially where they load direct from gravel pit to train, have been able to go ahead and have experienced little difficulty on account of the heavy rainfall. Bad roads, to them, have not proved a drawback, but they have reaped more business from the other fellow's troubles in this respect.

The J. Fred Smith Gravel Company is perhaps the largest gravel company in this section loading direct from gravel pit to train by means of steam

shovels and drag lines, and this company reports all the business it can handle. The West Dallas Sand and Gravel Company also has been able to go ahead with its gravel business, as its pits are just at the side of a concrete highway and it has been possible to keep the short stretch of road from the loading pits to the concrete highway in repair.

Highway construction in this section is now proving one of the heaviest drains on the gravel pits. Dallas county has recently awarded a contract for the Dallas-Garland Highway, which will be about 18 miles of 6 inch concrete roadway, 18 feet wide. The contract calls for the expenditure of nearly a million dollars.

Work is now under way on the Dallas-Mesquite highway, contract for which was let recently. This also is a concrete roadway, about 12 miles in length. And contract has been awarded for the Dallas-Denton highway, a concrete and asphalt roadway about 15 miles in length.

Movement by Truck in Wisconsin

BY O. C. HUBBARD
Executive Secretary, Wisconsin Mineral Aggregate Association

WHILE it is a fact that we have had a slight reduction in our freight rates, the rail movement in some cases has increased in about the same proportion as the reduction in freight rates. This freight rate decrease has also caused one county to re-consider and take new bids after their road program had been abandoned, and award contracts for twenty miles.

But here are some specific instances of the extent of the truck business:

In Waukesha County there have been awarded to date 42 miles of concrete road. All of this material with the exception of one small job of 1½ miles, is being handled by truck. The 1½ mile job is being taken care of by electric railway delivery, having a rate of 65 cents per yard for any distance from one end of their line to the other or approximately 45 miles. The shipment on this particular mile and a half is about twelve miles.

In Racine County there have been contracts awarded for approximately 16 miles. All of the coarse aggregate for these 16 miles is moving by truck, as well as the fine aggregate, with the exception of sand on one job of 4.4 miles, where the sand alone is moving by rail.

Owing to the large number of truck owners out of work and the keen competition in the trucking business, they immediately absorbed the 14 cents per ton reduction from Waukesha to Milwaukee, where freight rates were reduced from 70 cents to 56 cents a ton, and this material with hardly an exception is continuing to move by truck. There is one plant in Waukesha, with a capacity of from 15 to 18 cars a day, which is running to full capacity daily, with car shipments running one and two cars, and all the balance moving by truck. This particular shipper is in a position to ship over three different lines. Freight solicitors are visiting him daily, hunting business, with, as noted, the majority of the material continuing to move by truck.

Going back again to the Waukesha situation, some of these road contracts are being trucked a distance of 12 miles, making 24 miles for the round trip for each delivery. The shipping point is within a mile and a half of the center of the job.

Wisconsin producers are doing a very good business generally, with considerably less than 50 per cent of the grand total being handled by rail.

Increase in Business Slow But Steady

Many New Plants in Eastern Territory

By Our Eastern Correspondent

THERE is slow but steady improvement in the tone of the sand, gravel and crushed stone markets at New York and vicinity, and producers and dealers are showing a far more optimistic attitude. While the situation at the present time is practically featureless, inquiries indicate a gradual awakening and resumption. In the New York zone, apartment and house construction are receiving the bulk of attention, and the same holds true for the different important New Jersey districts.

With the advent of spring, and now with summer at hand, there has been a marked increase in the call for material for road construction, and throughout the Eastern district it is this phase of work upon which the sand and stone producer is basing his biggest hopes for sizeable orders. There are many state and county road contracts pending, involving in total well into the millions; there is but little question that the majority of this work will be under way at a very early date, and this will mean the placing of orders for large tonnages.

Prices are holding well at present levels, and while there is a buyer's inclination to "push downward," it has had but little, if any, effect on the situation. After a mighty lean winter, with fair price stability, it is unlikely now, when orders are coming in, that there will be very much recession. Building stone recently has shown quite a decline, averaging about 25 per cent lower than this time a year ago. This trend was inspired by the tumble in cement a few weeks ago, as recorded at the time in PIT AND QUARRY, and present stone prices are quite firm.

With dealers asking $4.25 a cubic yard for gravel, both 1½ and ¾-inch sizes, the wholesale market is moving rather slowly under a $2.50 figure, either size, in cargo lots; a year ago the 1½-inch material was being turned at $3.00, and the smaller size stock at the present $2.50 figure. Sand, wholesale, holds at $1.25 a cubic yard, as compared with a level of $1.50 a year ago; supply dealers are asking from $1.80 to $2.00 for the material, delivered on the job. High grade white sand shows no change from the $5.00 figure, delivered to site.

Crushed stone is holding its own with regard to prices, and recently established levels are being well maintained. Small material, ¾-inch, is selling for $2.15 a cubic yard in cargo lots, while 1½-inch stock varies from $1.90 to $2.00. Building supply dealers are asking $3.75 and $4.00 for the material.

Limestone, sandstone, bluestone and other kindred building stones are selling at the same figures as quoted in the last issue of PIT AND QUARRY, varying from $1.75 to $2.25 per cubic foot for the different selections. Present indications do not show any immediate change. White Vermont marble, sawed, is priced at $3.00 a cubic foot, and South Dover varieties at $2.25.

The $3.20 level for Portland cement has proved a popular figure, and a number of good sized orders have been taken at this price. The quotation includes delivery, and carries a bag rebate of 10 cents. Dealers are paying $2.40 for the material, f. o. b. New York. Lime has shown a perceptible decline during the past few weeks, as referred to in the last issue of PIT AND QUARRY, with prices there recorded still prevailing.

The Nepperhan Sand & Gravel Company, Nepperhan, Yonkers, N. Y., has

been incorporated with a capital of $10,000 to operate sand and gravel properties in this section. The company is headed by T. D. Gleeson, A. J. Rice and W. H. Thorn. B. Franklin, 38 Park Row, is representative.

The Croton Sand & Gravel Corporation, New York, has been formed under state laws with a capital of $10,000 to operate sand and gravel properties in the Croton district. The company is headed by W. C. Bentley, J. P. McAtee and M. E. A. Tucker. It is represented by Hoadley, Lauterbach & Johnson, 22 William street.

According to recently compiled official figures, the past few years have brought about a noticeable decrease in the number of quarrie sand mines in the New England district, with corresponding decrease in the number of persons employed. The report compares the figures of 1909 with those for 1919, and during this decade the number of such enterprises declined from 139 to 74, or 46 per cent, while the number of mines and quarries operated dropped from 147 to 79. In the earlier year a total of 3,588 persons were engaged in the industry, while the 1919 record for employment stands at only 1,922. The capital invested fell from $5,054,093 in 1909 to $4,822,574 in 1919, but in the same time salaries advanced from $213,358 to $324,602, and wages from $1,966,997 to $2,068,844. At the same time, the value of production rose from $3,467,888 to $4,175,699. Despite these findings, the outlook for progress in the industry in this section is encouraging, and it is believed that the 1920 and 1921 figures will show a noticeable resumption.

The Mar-Bell Products Company, Asbury Park, N. J., has been organized with a capital of $100,000 to manufacture cement and kindred products. The company is headed by Joseph P. Watson, Ira A. Clayton and Joseph G. McDonough, 500 Main street.

Stickler & Hinkle, Marietta, Pa., operating the Hiestand stone quarries, are keeping up production at a good rate at their plant and sizeable shipments are being made.

Cement production in the Lehigh Valley section of Pennsylvania is being maintained at a fair status, but there is a noticeable lack of orders. Export business has reached a very low point, and but few shipments are being made for such disposition, as compared with normal trade. Stocks on hand are more than sufficient to provide for any immediate call. The larger companies are showing no great let-up, but smaller mills are continuing a curtailment program. The Coplay Cement Company, Coplay, is expected to resume production on a capacity basis at its local "C" mill at an early date. Other companies on the producing list include the Atlas Portland Cement Company, with a large mill at Northampton, and the Lehigh Portland Cement Company. This latter organization has recently inaugurated a safety drive among the operatives at its different plants.

In another part of the state, at Bessemer, the Bessemer Limestone & Cement Company is maintaining a large production, running on a rated basis of 3,000 barrels a day. It is said that this may be increased at an early date, the plant being booked to capacity for a number of months to come. A recent daily shipment from the plant totaled 4,000 barrels.

Sand and gravel producers in the Pittsburgh district are keeping production up to a good point, and there is a fair distribution of material. The Keystone Sand & Supply Company is continuing operations in the Coraopolis district, and the towboat "Victory" has been engaging actively to and from this point; there are almost daily arrivals of flats with sand and gravel at Pittsburgh from the company's diggings. The Rodgers Sand

Company is another active organization and is turning sizeable quantities of material with the local trade. The new electrically operated dredge of the J. K. Davison & Brother Company will be one of the largest and most complete sand and gravel dredges in the country. It will be known as the "Allegheny," and is of all-steel construction, being 164 feet long, 45 feet wide, and with depth of 7½ feet. It will be operated exclusively on the Allegheny River.

The Hampton Roads Sand & Gravel Corporation, Norfolk, Va., recently organized with a capital of $200,000, will operate extensive properties on this section. C. Carroll Collums, Jr., is president, and R. T. Booker, secretary.

The Signal Mountain Cement Company, Chattanooga, Tenn., has taken bids for the erection of its new cement manufacturing plant on local site, estimated to cost about $200,000, with equipment.

Good Progress on Roads

Indiana Doing Much Better Than Last Year—Other Hoosier Notes

By Our Indianapolis Correspondent

PROGRESS on sections of the Indiana state highways system under construction is being made approximately four times as rapidly this year as in 1920, according to Chesley Gray, chief engineer of the state highway commission. Reports to Mr. Gray concerning construction work indicate that 3.57 miles of highway are built per week, which mileage equals the average construction record for a month last year. Work is to begin soon at four additional places. Mr. Gray estimates that when the four additional mixers are at work that the roadways will be constructed at the rate of approximately five miles a week. Under the new policy of the commission, as announced recently following a conference with Governor McCray, no additional construction contracts for improved highways are to be let until the prices of material and labor drop. Officials expect that under this plan now new improved roadway will be contracted for until next year.

However, the commission, in line with the new policy, is intending to have several roads in condition for the hard surfacing early next year. In order to carry out this plan the commission will probably let contracts for grading several sections of the state system within a short time.

Harlie M. Jackson, James A. Morton and Charles A. Nash, all of Petersburg, Ind., have organized what will be known as the White River Gravel Company with a capital stock of $5,000. The company will produce sand and gravel from extensive beds in White river.

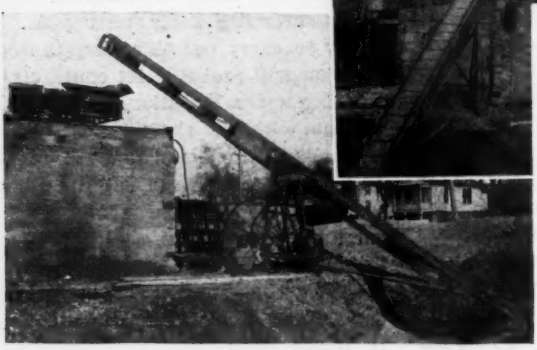
Ten contractors who have contracts totaling $2,225,198 for the construction in Indiana of state highways have been ordered by the highway commission to obtain new bonds because their present bonds are with companies which are either insolvent or are not deemed by the commission to be financially responsible.

A conference was held recently by dealers in crushed stone and Lawrence Lyons, director of the Indiana state highway department. As a result of the conference the dealers stated that they were unable to make a reduction in their material prices, as they did not wish to make a reduction in the prices of labor. Gravel and sand producers said they would reduce their prices from 5 to 15 cents a ton, and according to Mr. Lyons, the new average would be about 70 cents a ton, the price being about 75 cents a ton last year.

Unusual Use of Conveyors

An unusual method of getting gravel from the pit is employed by the Lyon Concrete Products Co., of Evanston, Illinois.

Two conveyors are used in series. One, a portable type, is placed on the edge of the pit, and "nosed" down into the gravel, which is pushed onto the feed end of the conveyor, which carries it up and empties onto a Barber-Greene stationary type conveyor. This second conveyor carries the material to a hopper delivering onto the screens.



Both machines are electrically operated, and have proved to be an efficient, economical, and altogether satisfactory means of getting the gravel from the pit.

The plant is producing an excellent quality of concrete block, and is unusually fortunate in having at its very doorstep a natural pit, with a good grade of gravel.

Caldwell Joins Link-Belt

Charles Piez, president Link-Belt Company, has just given out the following announcement:

"The Link-Belt Company has acquired all of the capital stock of the H. W. Caldwell & Son Company, and Mr. Frank C. Caldwell has been elected a director of the Link-Belt Company.

"Two experienced and successful companies in the conveyor world have thus joined forces, with the result that the Link-Belt Company has added two new lines, Helicoid conveyors and power transmission machinery, to its line of manufacturers.

"While the H. W. Caldwell & Son Company's plant will continue to operate under separate corporate existence and under its present name, the joint facilities of the two companies, and the broader avenues of distribution of the Link-Belt Company, ought to prove of distinct advantage to the customers of both.

"There will be no modification of the policies of the Caldwell plant, no impairment of its services to its customers, no change in the diversity or character of its product.

"The plant management will remain substantially the same, and the new owners, like the old, will proceed on the theory that the good will of its customers is the company's best asset.

In putting out fires, especially in coal piles or places hard to get at, a gallon of plain baking soda and water mixture has a fire extinguishing effect of 100 gallons of plain water.

The California Gypsum Corporation of Los Angeles, California, has been organized with a capital stock of $3,000,000, to develop gypsum properties, 30,000 share at $100.00 each. Subscribed $900.00.

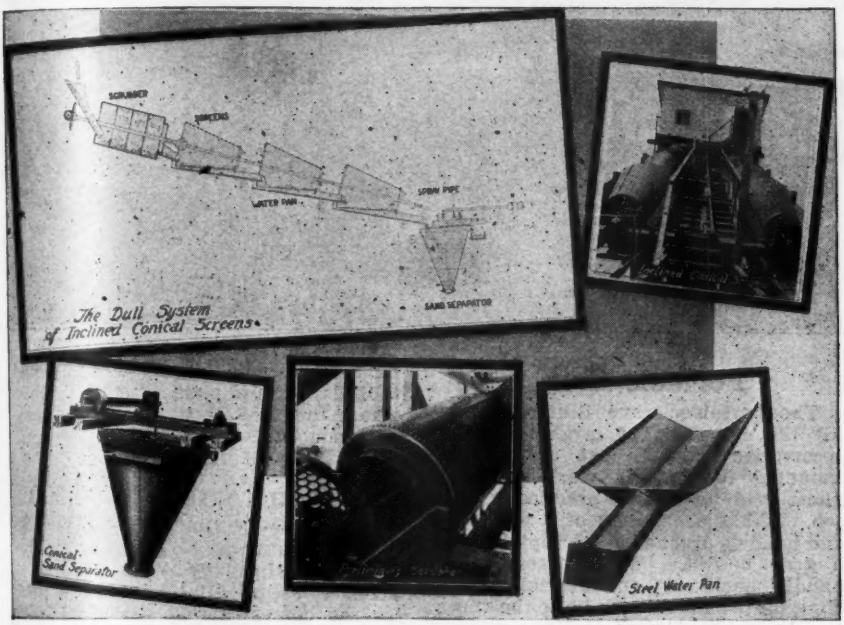
The Robinson Lime Co., Winchester, Tenn., has been incorporated with a capital of $250,000 to operate a local lime manufacturing plant. The company is headed by Arthur J. Robinson, W. S. Claiborne and A. G. Ferris, Winchester.

Sales Office Moved

The Good Roads Machinery Company has moved its general sales office from 821 Bulletin Building, Philadelphia, Pa., to Kennett Square, Pa. All correspondence should be addressed to the Kennett Square office.

LINK-BELT

Sand and Gravel Plants



ONE of the reasons for the success of Link-Belt Plants lies in the patented Dull system of inclined conical screens, illustrated.

The gravel, sand and water are fed into the first screen together, and pass directly through the large holes into a water-pan underneath, with the exception of the largest sizes of stones, which are screened out and discharged through the small end of the cone into the first bin. The water-pan delivers into the next screen where the process is repeated for the next operation, and so on through the desired number of separations. The material is fed into the large end of the screen which has the most wearing surface. This method provides the largest screening area where most of the material is screened and heaviest plates where the coarsest material is handled.

Send for Book No. 440.

LINK-BELT COMPANY

PHILADELPHIA CHICAGO INDIANAPOLIS

726 OFFICES IN PRINCIPAL CITIES

Portable Crane

The portable crane illustrated has all the functions of larger types of locomotive cranes, but it can be mounted to suit its working conditions and to reach practically any job. It has a capacity of 3 to 4 tons and handles crushed stone rapidly with a grab bucket. When necessary to handle machinery or material with a sling on the hoist block hook the ropes can be changed very easily.

Automobile trucks, rubber-tired trailers, steel wheel industrial type trucks, railroad flat cars, continuous tread as well as portal piers, barges and ground foundations can be used to mount the crane on. A great variety of work is therefore within its reach. No tracks are necessary—it can reach its working place readily—and when necessary and mounted to do so, it can be moved rapidly from place to place.

The crane unit is operated by its own gasoline or electric motor which furnishes power for all crane functions of hoisting, rotating, travel and even for steering on an industrial truck or for generator drive where current is needed for lifting magnet.

Only one operator is needed, who need not be a licensed engineer. He controls all functions of the crane from the cab, including steering, when equipped with power steering gear.

This crane is built by the Universal Crane Co. Swetland Building, Cleveland, Ohio, who have just completed their large new plant at Elyria, Ohio, where they are getting under increased production.

June Increase $10,000,000

The value of contracts let for the four weeks ending June 25, according to *Engineering News Record*, is $125,209,788, or $10,468,129 more than for the corresponding period of 1920. This takes no account of the decreased cost of building this year over last, which decrease would make the 1921 figures at least $140,209,788. The greatest activity of this year is noted in street and road and miscellaneous building construction, whereas the figures of 1920 were largely sustained by industrial projects. In street and road building this year's contracts for June so far totaled about $53,000,000, whereas the figures for the same period for 1920 were approximately $31,000,000. In miscellaneous building the respective figures are approximately for 1921 $36,500,000, and 1920, $31,000,000. The value of industrial contracts let in June, 1920, totaled in excess of $40,000,000, whereas this class of work this year yielded a contract value of only slightly above $5,000,000.

The Stillwell Sand and Gravel Co., Anderson, Ind., has increased its capital stock from $100,000 to $150,000.